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GOTO (K.). **Sclerotium rolfsii Sacc. in perfect stage. I. Some correlation between sporation and cultural characteristics.** —*Trans. Nat. Hist. Soc. Formosa*, xxiii, pp. 37–43, 75–90, 1 diag., 2 graphs, 1933.

A fully tabulated account is given of the writer's continued studies on 33 Formosan and eight foreign strains of *Sclerotium rolfsii* (one from India and seven from the United States) with regard to growth habit, hymenial, sclerotial, and mycelial characters, and rate of development [cf. *R.A.M.*, x, p. 344]. The strains were grown on potato, onion, apricot, and carrot agar for varying periods at 33° and 25° C. and room temperature.

The strains were found to be divisible into four groups in respect of sporulation, viz., I (readily spore-forming) comprising seven isolants, II (spore-forming) with eleven, III (hardly spore-forming) with ten, and IV (non-spore-forming) with thirteen. Group I included strains from potato (U.S.A.) and from six-rowed barley, sugar-cane, cantaloupe, and *Setaria italica*, all on the College Experimental Farm, Taihoku. Among the hosts of the strains comprising group II were pepper [*Capsicum annuum*], beans (*Phaseolus vulgaris*), iris, cantaloupe, peach, and *Cedrus deodara* [*C. libani* var. *deodara*], all from the United States. Group III comprised strains of the fungus from *Garcinia spicata*, clover (*Trifolium repens*), *Allium fistulosum*, and *Petasites japonicus*, all at Taihoku. Group IV was represented by strains from potato (India) and from a species of Cyperaceae, beans, *Lochnera rosea*, *Mentha arvensis* var. *piperascens*, groundnut, *Cymbidium* (?) *longisepalum*, and *Jasminum sambac*, all at Taihoku.

Onion agar was found to be the most favourable of the media used for hymenial production, which was in general most profuse in group I, whereas groups III and IV were characterized by abundant mycelial development. The carrot agar cultures were similar to those on onion, while on apricot mycelial growth was vigorous but hymenial formation very scanty. Potato agar was not a suitable medium for the strains of *S. rolfsii* cultured. In Petri dish cultures the Formosan strains, unlike those from the United States, usually produced little mycelial growth at the centre. On apricot agar sclerotial formation was abundant in groups I and II. In slant cultures a period of at least 30 (up to 100) days was requisite for hymenial formation. The American strains, which failed to produce the hymenial stage in their place

of origin, did so in the writer's experiments. The hymenium is generally pure white at first, sometimes turning yellowish to buff-coloured with age. In certain strains, however, e.g., that from *S. italica*, the colour on carrot agar was cartridge-buff, while various others ranged from pinkish-buff to zinc-orange. Generally speaking, the sclerotia of the spore-forming strains were globose, whereas those of the little or non-sporulating groups were depressed, nodular, or otherwise distorted. They mostly matured about 8 days after subculturing in the case of groups I and II and two days later in the others, but the strains from *C.* (?) *longisepalum* and potato (India) required 14 to 15 days on onion and 13 o. more on apricot agar. In colour the sclerotia ranged from red-orange to orange-yellow (Ridgway), those of groups I and II generally tending to develop a darker coloration, especially on potato agar, than the non-sporulating strains.

HORNBY (A. J. W.). **Report of the Assistant Director and Agricultural Chemist.**—*Ann. Rept. Dept. of Agric., Nyasaland, 1932*, pp. 36–47, 2 graphs, 1933.

This report contains the following observations on tobacco diseases in Nyasaland. Angular leaf spot (*Bacterium angulatum*) or a similar disease has caused losses up to 60 per cent. of the crop in certain years, but wildfire (*Bact. tabacum*) has not been observed since 1926, when it developed on plants raised from newly imported, non-disinfected seed.

Mosaic, ring spot, and leaf curl ('cabbaging') have been present on tobacco in Nyasaland for ten years [*R.A.M.*, viii, p. 204; xi, p. 676]. During 1931–2 plants at all stages of growth were found to be susceptible to leaf curl, but little damage resulted from slight late infection in the field. Nursery infection is more serious and may involve heavy losses in the field. Shrubby indigenous plants, such as *Vernonia* sp., seem to be most susceptible to leaf curl in the Southern Province, where they are prevalent on abandoned sites. In the Northern Province *V.* sp. is comparatively rare, but zinnias [ibid., xiii, p. 166] and hollyhocks have been found affected by leaf curl, the whitefly vector of which [*Bemisia gossypiperda*] is abundant. True frenching [ibid., xii, p. 205] is of very rare occurrence in Nyasaland. Ring spot was unusually prevalent in 1931–2, the primary lesions being invaded by a *Phyllosticta* which caused a rotting and crumbling of large leaf areas.

The most serious disease of flue-cured tobacco in Nyasaland is frog-eye (*Cercospora*) [*nicotianae*: ibid., viii, p. 204], which is of minor importance on the dark types. In wet weather the fungus attacks the upper as well as the lower leaves and the spots continue to appear in the barns.

Hollow stalk or pith rot (*Bacterium* [*Bacillus*] *carotovorus* and *B. aroideae*) [ibid., xii, p. 332], which is fairly common in wet seasons, is no doubt largely spread by topping and suckering operations, but the disease has occurred at Zomba on untopped seed plants.

In 1927–8 a serious outbreak of black stem rot was reported associated with *Pythium aphanidermatum* [ibid., viii, pp. 204, 744] but with symptoms of Florida black shank, the presence of

the agent of which (*Phytophthora parasitica nicotianae*) [ibid., xii, p. 793] in Nyasaland has since been confirmed. Infection has been practically eliminated by the abandonment of affected fields and nurseries since the epidemic.

GRATIA (A.). **Pluralité antigénique et identification sérologique des virus de plantes.** [Antigenic plurality and serological identification of plant viruses.]—*Comptes rendus Soc. de Biol.*, cxiv, 35, pp. 923–924, 1933.

Following up Miss Purdy's serological experiments with tobacco mosaic [*R.A.M.*, viii, p. 743], the writer prepared sera against two types of tobacco mosaic, potato mosaic, and potato leaf roll, and also from healthy tobacco. The virulence of the two tobacco mosaics was absolutely neutralized by either of the two tobacco mosaic antigens. None of the other sera produced this effect, their action, like that of normal serum, being confined to a very slight retardation of the symptoms. In a mixture of equal parts of mosaic tobacco juice and anti-mosaic tobacco serum, intense flocculation is rapidly produced, but this phenomenon does not accompany the blending of the tobacco mosaic antigen with that of potato mosaic or vice versa. On the other hand, the potato mosaic antigen flocculates the potato mosaic virus even after transmission to tobacco. Neither the tobacco nor the potato mosaic antigen induces flocculation in the juice of mosaic beetroots. These data are considered to demonstrate the antigenic plurality of plant viruses.

GRATIA (A.). **Qualité antigénique des virus des plantes et des bactériophages.** [The antigenic quality of plant viruses and bacteriophages.]—*Comptes rendus Soc. de Biol.*, cxiv, 35, pp. 925–926, 1933.

In connexion with his serological experiments with tobacco mosaic [see preceding abstract], the writer observed that the juice of mosaic tobacco is not flocculated by the healthy tobacco antigen, and, conversely, the juice of healthy tobacco is flocculated neither by the healthy nor by the mosaic tobacco antigen. Flocculation, therefore, is associated with the mosaic and not with the tobacco 'element', and tobacco mosaic must be conceived as having two antigens, one of very mediocre properties, namely, tobacco, and the other very potent—mosaic. This fact is considered to support the usual view that mosaic is due to an external agent in the shape of a parasitic filterable virus, rather than to an enzyme produced by the plant itself.

It was further observed that certain tobacco plants showed a natural resistance to mosaic infection, and the juice of their leaves, several weeks after inoculation, did not react by flocculation to the addition of anti-mosaic serum, showing that the virus was not present. In diseased plants some leaves (mostly the young ones) show conspicuous symptoms, while others look normal. Mixed with the specific serum, the juice prepared from the former undergoes flocculation in five minutes, whereas that from the latter requires several hours for the same effect to develop, indicating that the virus is present only in small quantity. On the addition of the specific serum to the juice of the pericarp flocculation occurs

in five minutes, while the juice of the interior of the seed does not become flocculated. The process of flocculation, therefore, is an indication of the presence and concentration of the pathogen. Assuming that the active element in flocculation is mosaic, the accompanying passive tobacco element contributes, by its mass and colour, to the visibility of the mosaic precipitate. Mosaic tobacco juice passed through a Berkefeld candle and thus impoverished of the tobacco element gives only a very faint and sometimes invisible precipitate on the admixture of the specific serum; added to healthy tobacco juice, however, it confers on the latter the capacity to respond by flocculation to the anti-mosaic serum. Attention is briefly drawn to the analogies between tobacco mosaic and the bacteriophage phenomenon which the writer is likewise inclined to refer to exogenous agency.

MAY (R. G.). **Prevention of blue mould of Tobacco. Methods adopted with success at Bathurst.**—*Agric. Gaz. New South Wales*, xliv, 10, pp. 745–748, 1 fig., 1933.

This is a brief account of the methods of raising tobacco seedlings in hot air-heated frames, which are stated to have been successfully applied for the last twelve years at the Bathurst Experiment Farm, New South Wales, and to have afforded good control of tobacco blue mould [*Peronospora tabacina*: *R.A.M.*, xiii, p. 214]. Briefly stated, they consist in steaming the soil in the frames just before sowing the tobacco seed, which should be done while the soil is still warm. After sowing, the seed is pressed firmly into the soil with a piece of flat board and covered with fine hessian, which is kept watered with tepid water four or more times a day. The temperature in the frame is kept warm by hot air flue pipes and must not be allowed to drop to 45° or rise above 110° F., care being taken not to open the frames too wide when watering until the seedlings are sufficiently hardened, i.e., until the leaves are about 1½ to 2 inches long. The seedlings are transplanted when they are about 6 inches high.

ARNAUDI (C.). **On the vaccination of the Tobacco plant against Thielaviopsis basicola.**—*Bull. Torrey Bot. Club*, lx, 8, pp. 583–597, 4 figs., 1933.

The writer's experiments [details of which are given] at the Serotherapeutical Institute, Milan, indicated that the resistance of Beckley tobacco to *Thielaviopsis basicola* [*R.A.M.*, xii, p. 493] may be increased by the injection of vaccines prepared from cultures of the fungus by various procedures. The most toxic vaccines are those prepared by trituration of the fungal mat and exposure to the action of ether vapour, which in 48 hours causes the material to become more fluid owing to the plasmolysing action of the ether on the cells. The ether is removed by heating to 37° to 40° C. followed by evaporation *in vacuo*, and the residue diluted with three parts of water. The fact that a similarly prepared *Pythium* vaccine induces no apparent symptoms in inoculated plants proves that the toxicity of the ether-killed *Thielaviopsis* vaccine is not due to adherent traces of ether. From the point of view of inducing immunity, however, a dry vaccine prepared as before but without dilution with water was the most effective, maintaining its efficacy

for two months and acting equally well whether added to the soil in which the germinating seeds were placed or administered to seeds already germinated. The aqueous vaccines were less active when added directly to the soil. Under the conditions of the tests, the immunity acquired by absorption of these vaccines through the roots persists for some two months, a sufficient period to protect the plants during the early stages of development when susceptibility to infection is at its height. In the writer's opinion, the time is now ripe to apply the vaccine treatment against *T. basicola* on a large scale to field tobacco. Very small quantities of vaccine are needed for the treatment of a large number of seedlings, while the technique of preparation is simple and inexpensive [cf. ibid., xiii, p. 117].

MANDELSON (L. F.). **Frog eye leaf spot and barn spot of Tobacco.** —*Queensland Agric. Journ.*, xl, 5, pp. 401–408, 1 pl., 1933.

Tobacco frog eye leaf spot (*Cercospora nicotianae*) [*R.A.M.*, xii, pp. 118, 476, 794] is very prevalent in parts of northern Queensland, where considerable spotting occurs in the field under favourable environmental conditions. The development of further spotting in the curing process ('barn spot') is even more serious [ibid., ix, p. 141], and under the conditions prevailing locally the market value of a crop may be seriously diminished.

As the disease is of major importance only in the tropical areas its optimum development is probably associated with high temperature and humidity. *C. nicotianae* attains its greatest development at about 80° F.; it does not grow at temperatures below about 45° or over about 93°. Spotting is most pronounced when light rains or heavy dews are frequent or when wet weather prevails while the crop is maturing. No varietal resistance has been observed in Queensland.

To secure proper field sanitation against this and some other diseases old tobacco plants must be entirely removed and destroyed not later than one month after harvesting. Any leaves removed from the growing crop must also be carried away from the field and carefully destroyed. The spraying of the seedlings against blue mould [*Peronospora tabacina*: see preceding page] also serves as a protection against frog eye. The most effective control of both frog eye and barn spot, however, is given by early priming, which should be regarded purely as a preventive measure. The leaf should be harvested as soon as mature, over-ripe tissues being highly susceptible.

KOMLÓSSY (G.). **Adatok a Dohánybetegségek elleni védekezési eljárások ismeretéhez. I. Higanytartalmú czávázószerek physiológiai hatásának összehasonlitó vizsgálata a Dohánymagvakra és a mag útján terjedö kórokozókra.** [Contributions to the knowledge of the methods of control of Tobacco diseases. I. Comparative experiments on the physiological effects of mercury-containing disinfectants on Tobacco seed and seed-borne agents of disease.]—*Kisérletügyi Közlemények*, xxxvi, 1–3, pp. 134–163, 2 figs., 9 graphs, 1933. [German summary.]

A comprehensive, fully tabulated account is given of the writer's

experiments at the Budapest Plant Protection Research Institute on the efficacy of five disinfectants in the control of two fungi responsible for heavy damage in tobacco seed-beds, viz., *Alternaria tenuis* and *A. brassicae* Berk. var. *tabaci* Preiss. [*A. tabacina* Gulyás: *R.A.M.*, xi, p. 135]. To test the effect of the fungicides on germination, seeds of *Nicotiana tabacum* var. *latifolia*, *N. latissima* var. *ovata*, and *N. rustica* var. *cordata* were immersed for 10, 30, or 60 minutes in 0·05 to 0·5 per cent. solutions, while fragments from pure cultures of the organisms were subjected to the same treatment for similar periods to determine the relative value of the treatments. On the basis of the resulting data the writer recommends 10 minutes' immersion in 0·1 per cent. higosan [ibid., x, p. 603] or 0·1 to 0·2 per cent. tillantin, 30 minutes in 0·15 to 0·1 per cent. tillantin, and 60 minutes in 0·1 to 0·2 germisan or 0·3 to 0·5 per cent. uspulun, all of which are absolutely fungicidal under the specified conditions. Higor was found to be unsuitable for the object in view.

Wann (F. B.) & Blood (H. L.). **Biochemical changes accompanying curly top of Tomato.**—Abs. in *Phytopath.*, xxiii, 11, p. 929, 1933.

The juice of tomato plants suffering from curly top [*R.A.M.*, xii, p. 424] was found to contain considerably more pulp, sugars, and solids than that of healthy ones, while the freezing-point depression was also higher in the former. The titratable acidity of the leaf juice decreased and that of the stem juice increased as a result of the disease, which further caused a reduction of catalase activity in the foliage [cf. ibid., xii, p. 778]. Total sugars increased and total nitrogen decreased in the diseased leaves; in the affected stems there was an increase in total sugars and starch, while the total nitrogen was augmented in some varieties but declined in others.

Shapovalov (M.). **The dieback form of Tomato streak.**—Abs. in *Phytopath.*, xxiii, 11, p. 928, 1933.

A very destructive form of tomato streak [*R.A.M.*, xii, pp. 79, 333], locally known as 'die-back', is reported to be prevalent on the Pacific Coast, where 100 per cent. infection has been observed in some fields. The affected plants, which are usually worthless, show a die-back of the new shoots for several inches, often accompanied by 'bronzing' of the leaves, but no mosaic mottling. These symptoms are similar to those induced by spotted wilt [ibid., xiii, p. 190]. The transmission of this type of streak, in contradistinction to the ordinary 'combination' known by that name [cf. ibid., xiii, p. 193], could not be readily effected by swabbing the juice from diseased on to healthy plants, while biological differentiation tests showed that neither the green tobacco nor the latent potato virus is a component of the die-back virus.

Bryan (Mary K.). **Bacterial speck of Tomatoes.**—*Phytopath.*, xxiii, 11, pp. 897–904, 3 figs., 1933.

Tomato fruits in Florida, Wisconsin, and Maryland have been found to show a 'peppering' of minute, black, slightly raised, rela-

tively superficial spots, formerly believed to represent a phase of bacterial spot (*Bacterium vesicatorium*) [*R.A.M.*, xii, p. 555] but shown by the writer's investigations to be caused by a hitherto undescribed organism, which is named *Bact. punctulans* n. sp. The lesions on the leaves are round, dark brown to black, extending from the upper to the under surface, but seldom exceeding 1 mm. (the size of the fruit specks) in diameter; adjacent spots may coalesce into large, irregular blotches, the surrounding tissues turning yellow. Artificial inoculations were successful on the stems, petioles, peduncles, pedicels, sepals, and fruits. Infection occurs through the hairs, when these have been injured from any cause, and was also obtained on the cotyledons and young stems of seedlings grown in contaminated soil.

On P_H 7 beef agar slants *Bact. punctulans* occurs mostly as single rods or pairs, sometimes as chains or filaments, the individual cells being 1·3 to 2·5 by 0·6 μ in diameter, motile by up to 7 polar flagella, capsulate, Gram-negative, and non-acid-fast. Green to bluish-green fluorescence is a conspicuous feature of the colonies on beef infusion agar or broth and in Uschinsky's and Fermi's solutions. The organism liquefies gelatine, turns litmus milk blue and coagulates it, reduces nitrates, and utilizes sucrose, dextrose, maltose, lactose, glycerine, and mannite with acid formation (except in the case of maltose and lactose) but no gas, and produces ammonia. The optimum hydrogen-ion concentration for the growth of *Bact. punctulans* was found to range from P_H 6·6 to 7·4, fluorescence being most marked at 7·4 to 7·6. The optimum temperature for the development of the organism lies between 23° and 25° C., with a minimum at 6° and thermal death point at 51°. The bacterium proved highly sensitive to desiccation, most of the strains succumbing to 48 hours' drying.

NOJIMA (T.). **Studies on Polyporus mikadoi Lloyd and Polyporus patouillardii Rick. causing the heartrot of deciduous trees.** —*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 154–171, 2 pl., 2 figs., 2 graphs, 1933. [Japanese, with English summary.]

An account is given of the writer's morphological, pathological, and physiological studies on two fungi causing heart rot of certain deciduous trees near Kyoto, Japan, viz., *Polyporus mikadoi* [*R.A.M.*, xi, p. 813] and *P. patouillardii*. The sporophores of the former species occur in large numbers on the sides of the trunks of weakened or dying cherry trees, while those of the latter are more commonly found on the butts of living *Pasania cuspidata* and oaks (*Quercus gilva* and *Q. glauca*). In the heartwood of *Q. gilva Polyporus patouillardii* produces large, irregular, white areas and small white pockets. Both species may be regarded as belonging to the 'white' lignin-dissolving group of wood-rotting fungi [ibid., xii, p. 740]. The hyphae of both species were found to be capable not only of traversing the pits on the cell walls but also of boring directly through the walls.

Pure cultures of *P. mikadoi* and *P. patouillardii* were readily obtained on apricot, soy-bean, and potato decoction agars. *P. mikadoi* made good growth between 24° and 36° C. with an optimum

just above 30°, the corresponding range for *P. patouillardii* being 24° to 32° (28°). Using Bavendamm's technique [ibid., viii, p. 281], the writer tested the nutritive value of tannic acid in concentrations ranging from 0·05 to 0·5 per cent. in potato decoction agar cultures of both species, the growth of which was found to be promoted between concentrations of 0·05 and 0·1 per cent. The results of these tests are considered to strengthen the evidence regarding the lignin-dissolving properties of the fungi.

Beech disease in Maine forests follows in wake of scale insect.—*Journ. of Forestry*, xxxi, 7, pp. 347–348, 1933.

It is stated that the *Nectria* [*coccinea*] canker has destroyed about one-third of the beech trees of Nova Scotia and many of those in southern New Brunswick. R. K. Beattie found 13 infestations of the European beech scale [*Cryptococcus fagi*], the precursor of the canker, in five towns near Liberty in south-central Maine, the oldest and largest of which, covering 50 acres, is accompanied by canker. The insect and disease have also been found in south-eastern Maine and the insect alone in Massachusetts [*R.A.M.*, xii, p. 405]. The scale forms a white, cottony fluff on the bark and may be followed by the small, red fructifications of the fungus, which is believed to have been introduced from Europe. An intensive study of the disease and insect is to be undertaken immediately by American forest pathologists and entomologists.

Laubert (R.). **Mehltau und Rhytisma auf Acer negundo.** [Mildew and *Rhytisma* on *Acer negundo*.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 11, p. 94, 1933.

Attention is drawn to the occurrence on *Acer negundo* of two parasitic fungi seldom found on this widely cultivated tree in Germany, namely a mildew (? *Uncinula aceris*) [*R.A.M.*, x, p. 274], also observed on *A. californicum* at the Berlin-Dahlem Botanical Garden; and *Rhytisma acerinum* [see next abstract], commonly reported on *A. platanoides*, *A. pseudoplatanus*, and *A. campestre* but apparently not hitherto recorded in Germany on the present host.

Maxwell (H.). **The Sycamore fungus.**—*Nature*, cxxxii, 3341, p. 752, 1933.

Since the writer's previous note on the apparent absence of *Rhytisma acerinum* from sycamores at an altitude of 1,200 to 1,400 ft. at Corrour, Inverness-shire [*R.A.M.*, xiii, p. 135] a few leaves have developed the spots of the fungus, the mode of dispersal of which still remains unknown.

Peace (T. R.) & Holmes (C. H.). **Meria laricis the leaf cast disease of Larch.**—*Oxford Forestry Mem.* 15, 28 pp., 5 pl., 1933.

The authors state that the most important disease affecting European larch (*Larix decidua*) in English nurseries is probably leaf cast (*Meria laricis*) [*R.A.M.*, i, p. 404; xii, p. 342] the systematic position of which is stated to be obscure. On the leaf the details of spore formation agree almost exactly with those given

in Vuillemin's description. The hyphae are very fine, thick-walled, intercellular and without haustoria. It was calculated that one infected needle bore at a time from 10,000 to 360,000 spores. In culture each sterigma produces a fresh spore as one is shed. The spores in young cultures average about 9·3 by 3·1 μ (broadest diameter) and are slightly constricted at the centre, where a septum is subsequently laid down. In old cultures the average length of the spores may be 12·4 μ.

Two strains were commonly encountered, one more rapidly growing and more profusely sporing than the other. The number of cells and sterigmata on each conidiophore varied, but in hanging drop cultures at laboratory temperature each sterigma produced an average of one spore per day. Germination took place fairly readily in water, from one or exceptionally both ends of the spore. Without a nutrient little mycelial growth was made, the spores persisting in a state of partial germination or forming other spores on the end of short hyphae. Germinating spores sometimes produced microconidia arising either from a small protuberance or a definite septate conidiophore exactly like the macroconidiophore except for its small size and thin wall. All gradations appeared to exist between the typical macroconidium and the cylindrical microconidium averaging 3·6 by 1·4 μ, but the latter failed to germinate.

The optimum range for growth in culture was 15° to 20°; at temperatures over 25° growth dropped rapidly to zero. At 5° growth was slow but even at –12° the fungus suffered no damage, and resumed growth immediately on removal to warmer conditions. Kept moist the spores from cultures remained viable for long periods (at least 14 weeks), but they survived drying for only a very short time (one hour to two days).

Inoculation experiments [which are fully described] readily gave positive results on *L. decidua*, evidence being obtained that the resistance of the Japanese larch (*L. kaempferi*) is largely due to physiological factors. Seed origin appears to have little effect on the disease. The fungus overwinters on the old needles and on those lying on the ground. It is probably introduced into new nurseries with infected transplants, as natural dissemination appears to be limited in extent.

The disease, from the point of view of control, may be considered to be confined to the nursery. In general, attacks are worst on 2-year beds, the severity of those on 1-year beds depending largely on the date of the first infection and the weather during summer. Damage is likely to be severe only when the primary infection is early and the summer wet. Infection, which was general between 10° and 25°, slight at 5° and 0°, and apparently impossible at 30°, is not dependent on frost injury, and the symptoms differ from those of the latter in that the fungus browns the middle or end of the needle and then spreads down it, whereas frost kills the whole needle at once. *M. laricis* seldom attacks the needles at the extreme tip of the shoot, which is the part most liable to frost injury. Needles attacked by the fungus remain less shrivelled than those killed by frost and usually fall, whereas those damaged by frost generally remain on the plant throughout the season.

Effective control was obtained in nursery beds by a single application of 3 to 5 per cent. amberene [ibid., ix, p. 537], 2 to 3 per cent. sulsol [ibid., xiii, p. 98], or liver of sulphur 14 lb. per 100 galls. water, used at the rate of 5 or 6 galls. per 100 sq. yds., towards the end of February or the beginning of March, followed by further applications every two or three weeks from the end of March until the beginning of August of 1·5 per cent. amberene, 1 per cent. sulsol, liver of sulphur 7 lb. per 100 galls. water, or precipitated sulphur 10 lb. per 100 galls. water. The last-named is less satisfactory than the other sprays and should be used with a caseinate spreader (2 lb. per 100 galls.) or soft soap. Applications should be at the rate of 4 galls. per 100 sq. yds. During dry periods spraying should be discontinued, and the winter strength sprays must not be used after the needles begin to elongate. Satisfactory control is not possible if spraying is delayed until the disease has appeared.

The cost of spraying 1,000 sq. yds. (omitting the labour cost, which can be estimated on the assumption that one man sprays this area in 2 hours) was, using 6 galls. per 100 sq. yds.: amberene 3 per cent. and 5 per cent., 10*s.* 6*d.* and 17*s.*, respectively, sulsol 2 per cent. and 3 per cent., 17*s.* 6*d.* and 26*s.* 6*d.*, respectively, and liver of sulphur 14 lb. per 100 galls. 12*s.* 6*d.*

[A short, popular summary of this paper is given in *Forestry Comm. Leaflet* 21, 6 pp., 3 figs., 1933.]

FILLER (E. C.). **Blister rust damage to Northern White Pine at Waterford, Vt.**—*Journ. Agric. Res.*, xlvii, 5, pp. 297–313, 2 figs., 2 diags., 1 graph, 1 map, 1933.

The investigation reported in this paper was carried out from 1924 to 1930 on a total of 2,226 northern white pines (*Pinus strobus*) on an area of 27·43 acres at Waterford, Vermont, 416 of which were 60 years old and stood in a mixed stand of this species with spruces and hardwood trees. The trees were grouped according to their height and to the number of years they had been exposed to infection with blister rust (*Cronartium ribicola*) [*R.A.M.*, xii, p. 799] from neighbouring black currant bushes, which had been destroyed in 1917, and from wild *Ribes* species which were eradicated in 1925. In that year the incidence of the rust was found to range in the different classes of the white pines from 0 to 62 per cent., the proportion of the infected trees increasing with their height and with the number of years of exposure to infection. In 1930, 76 per cent. of the 416 60-year-old trees were found to be infected (including 24 per cent. of the total which had already been killed), and 65 per cent. of them were considered to be doomed owing to the presence on them of trunk cankers which have been proved to be almost invariably fatal. The percentage of the diseased trees killed by the rust increased from 11 in 1925 to 31 in 1930, representing an average yearly increase of 4 per cent. deaths. The proportion of infected trees in this stand was greater in the unsuppressed than in the suppressed group, presumably because of the larger crowns in the former group, but pines of the latter were being killed more quickly owing, at least in part, to their smaller size. With the exception of the largest-sized group, some trees had already been killed in all the other classes.

The proportion of the basal area (i.e., the area of a cross section of the trunk at stump height inside the bark) of the white pines represented by dying or dead trees increased from 8 per cent. in 1925 to 23 per cent. in 1930, an average yearly increase of 3 per cent., and it is believed that the killing of the trees will eventually reduce the basal area of this species in the area by between 64 and 79 per cent. The same also applies to the proportion of the total board-foot volume of the white pines represented by the trees beginning to die or already killed by the disease. It is thought that if the further spread of infection had not been checked in 1925 by the eradication of all species of *Ribes* in the vicinity, the ultimate loss of white pines would have approached 100 per cent. The actual economic loss in the merchantable stand, represented by the 416 60-year-old trees, from blister rust, calculated at a normal stumpage value of $8 per 1,000 ft., amounted to $19·86 per acre, and as additional pines die or deteriorate, the loss will increase to a maximum between $112·16 to 139·18 per acre, depending on the length of time before the stand is felled.

LACHMUND (H. G.). **Resistance of the current season's shoots of Pinus monticola to infection by Cronartium ribicola.**—*Phytopath.*, xxiii, 11, pp. 917–922, 1 diag., 1933.

Since the environmental and other obvious conditions predisposing to infection by blister rust (*Cronartium ribicola*) are at least as favourable on the needles produced on the current season's growth of *Pinus monticola* as on older ones, and probably more so, the paucity of cankers due to sporidial infection in any one year on the growth of that year compared with the numbers on the older internodes is attributed to the possession by the needles borne on the former of a purely temporary resistance, declining rapidly during the first season and scarcely extending into the second [*R.A.M.*, xii, p. 603].

PRETI (G.). **Moria delle piantine di 'Pinus australia' per 'fusariosi'.** [Seedling blight of '*Pinus australia*' due to 'fusariosis'.]—*Riv. Pat. Veg.*, xxiii, 9–10, pp. 363–369, 3 figs., 1933.

This is a brief account of a severe outbreak of a blight of germinating seedlings of *Pinus 'australia'* which was observed in the spring of 1933 in a large nursery in Savona, Italy, and found to be caused by *Fusarium roseum* [*Gibberella saubinetii*]. The paper terminates with recommendations for the control of the trouble, chief among which is the disinfection of the soil in the seedbeds. The seed should be steeped for 10 hours in a 0·05 per cent. copper sulphate solution and washed afterwards in milk of lime to neutralize the deleterious effect of the copper sulphate on germination.

HINTIKKA (T. J.). **Muutamia havaintoja Männyn tuudenpesistä.** [Contributions to the knowledge of witches' brooms of Pine.] —Reprinted from *Acta Forest. Fennica*, xxxix, 15 pp., 7 figs., 1933. [German summary.]

Seeds from 20 cones from a witches' broom on pine in Karelia,

Finland, were sown in May, 1931 and the resulting seedlings planted out in the autumn of 1914. In 1919, when the 84 plants had to be transferred to another site, 41 were found to be normal and 43 of the witches' broom type. In 1923 the average length of the 1922 shoots on the normal plants was 16·7 cm. compared with 6·8 cm. for those on the witches' brooms. It is evident that the tendency to witches' broom formation in pines is hereditary [*R.A.M.*, xiii, p. 202]. In agreement with M. Hertz (*Luonnon Ystävä*, xxvi, p. 147, 1923) and Liernur [*R.A.M.*, vi, p. 706], the writer regards the manifestation as a form of nanism. Of the above-mentioned witches' broom plants only nine are now surviving, their height varying from 85 to 180 cm., while that of the normal individuals is 4 to 5 m.

FINDLAY (W. P. K.). **Recent research on timber.**—*Science Progress*, xxviii, 109, pp. 61–68, 1933.

A semi-popular account is given of the researches on various aspects of timber protection in progress at the Forest Products Research Laboratory, Princes Risborough. In connexion with the observations on dry rot (*Merulius lacrymans*), it is mentioned that a recent outbreak of the fungus on a large housing estate near London caused damage to the value of £39,000 (*The Times*, 5th April, 1933) [cf. *R.A.M.*, xii, pp. 68, 669].

KAMESAM (S.). **Testing and selection of commercial wood preservatives.**—*Forest Res. Inst., Dehra Dun, Forest Bull.* 81 (Econ. Ser.), 40 pp., 2 diags., 1933.

A fully detailed and tabulated account is given of the writer's laboratory experiments at the Dehra Dun Forest Research Institute, India, on the relative efficacy of a number of wood preservatives against *Coniophora cerebella* [*C. puteana*], *Lenzites thermophila*, and *Fomes annosus* on pine (*Pinus sylvestris*) and beech. As in previous tests, falkamesam (equal parts of sodium arsenate and potassium dichromate) gave eminently satisfactory results [*R.A.M.*, xi, p. 685], showing a better fixation of arsenic in the wood than any of the other substances tried. It was also effective against beetles.

CHAPMAN (A. D.). **Effect of steam sterilization on susceptibility of wood to blue-staining and wood-destroying fungi.**—*Journ. Agric. Res.*, xlvii, 6, pp. 369–374, 1 fig., 1933.

In the experiments briefly reported in this paper, two species (*Ceratostomella pilifera* and *Graphium rigidum*) of the blue-staining fungi and two (*Poria incrassata* and *Lentinus lepideus*) of the wood-rotting fungi developed better, under strictly comparable conditions, on three species of coniferous wood that had been autoclaved for 5 minutes at 12 lb. pressure or for 30 minutes at atmospheric pressure, than on untreated wood, as judged from the fact that the former fungi caused a greater reduction in the strength, and the latter led to more loss in weight, of the steamed wood than of the control material. These results would indicate that considerable caution is necessary in interpreting the results of experiments to test the action of wood-deteriorating fungi, in

which the wood is subjected to heating or sterilization by steam, as apparently this process renders the wood a more congenial substratum for at least some of the organisms than the natural product.

VERPLANCKE (G.). **Hôtes nouveaux des maladies à virus filtrants de la Betterave.** [New hosts of the Beetroot diseases due to filterable viruses.]—*Bull. Soc. Roy. Bot. de Belg.*, Sér. 2, xv, 2, pp. 137–147, 1933.

A tabulated account is given of the writer's cross-inoculation experiments at Ghent, Belgium, with the yellows and mosaic viruses of beet on 60 plants (mostly common weeds), the results of which have already been summarized from another source [*R.A.M.*, xiii, p. 211].

SEVERIN (H. H. P.) & FREITAG (J. H.). **Some properties of the curly-top virus.**—*Hilgardia*, viii, 1, pp. 1–48, 3 figs., 1933.

The results of further experiments [full details of which are given] on the transmission of curly top of beet by the leafhopper *Eutettix tenella* [*R.A.M.*, xi, p. 419; cf. xiii, p. 4], showed that the nymphs of the insect failed to transmit the disease if fed on juices extracted in free air from the leaves of experimentally infected seedlings in the greenhouse, whereas infections were obtained when they were fed on juices extracted under anaerobic conditions [by a method which is described]. Apparently the failures in the first series were due to oxidation of the virus. Comparative tests showed that nymphs fed on centrifuged juices from diseased beet roots transmitted the disease more readily than those fed on similarly treated juice from the leaves.

The longevity of the virus in the filtrate from diseased root juice, prepared under aerobic conditions, was 7 days, while the filtrate prepared under partly anaerobic conditions from supercentrifuged juice gave infections at the end of five weeks. In the filtrate adjusted to P_H 5 and 6, and kept protected against access of air, the virus was still active after 100 days, when the experiment was concluded, but in the similar filtrate adjusted to P_H 3·5, it was apparently inactivated in a week. Attempts to cultivate the virus in a nutrient solution (300 c.c. sterile beet root juice, 50 c.c. 2 per cent. beet sugar, and 50 c.c. 2 per cent soluble starch solution) under anaerobic conditions were unsuccessful.

It was further found that the curly top virus lost its activity in the pulp of diseased beet roots slowly dried in the greenhouse for five weeks. Inoculum prepared from dried infective leafhoppers was found not to contain active virus. The virus retained its infectivity when the juice from diseased beet roots was diluted with centrifuged juice extracted from Alameda or Mammoth sweet maize (both immune from curly top) at rates from 4 in 1 to 1 in 2, but in dilutions at the rate of 1 in 50, 1 in 100, and 1 in 200, it was inactivated in 2, 4, and 6 hours, respectively.

Supercentrifuging the diseased beet root juice three times did not result in apparent sedimentation of the virus, and no increase in the number of infections was obtained with the supercentrifuged liquid prepared by resuspending the gummy residue in distilled

water; when a mixture of this liquid and aluminium gel was added to diseased root juice filtrate, no infections were obtained after the first day. The tolerance to dilution of centrifuged diseased root juice and of the virus extract from infective leafhoppers was found to be 1 in 1,000 and 1 in 24,000, respectively. The thermal death point of the virus was 80° C. in 10 minutes' exposure. Filtered diseased beet root juice retained its infectivity for over eleven months when kept at — 18° C.

VAN HALTERN (F.). **Spraying Cantaloupes for the control of downy mildew and other diseases.**—*Georgia Exper. Stat. Bull.* 175, 53 pp., 6 figs., 1933. [Abs. in *Exper. Stat. Record*, lxix, 5, pp. 668–669, 1933.]

The stems, leaves, tendrils, and blossom peduncles of cantaloupes in Georgia are subject to infection by downy mildew (*Pseudoperonospora cubensis*), the incubation period of which ranges from 4 to 13 days according to the temperature. In air saturated with moisture sporulation occurred between 45° and 86° F., but it did not occur if there were free water on the leaf. Germination of the conidia took place at a temperature range from 34° to 80·6°, with an optimum between 66° and 70°. Dry, hot sunlight or temperatures much exceeding 86° destroyed the conidia even in water.

The theory is advanced that Florida serves as a perpetual source of infection by this downy mildew for Georgia and more northerly States, where the loss from the disease is negligible in seasons when the spring is cool and dry in Florida, retarding the development and spread of the fungus.

The best control of *P. cubensis* was by weekly applications during vegetation of Bordeaux mixture composed of 1 lb. snowform copper sulphate and 2 lb. hydrated lime per 50 galls. water [cf. *R.A.M.*, xii, p. 493].

Brief notes are given on powdery mildew [*Erysiphe cichoracearum*], anthracnose [*Colletotrichum lagenarium*], and *Macrosporium* leaf blight [*Alternaria cucumerina*: ibid., xi, pp. 152, 557, 620] of cantaloupes.

WARE (W. M.). **A disease of cultivated Mushrooms caused by Verticillium malthousei sp. nov.**—*Ann. of Botany*, xlvii, 188, pp. 763–785, 2 pl., 6 figs., 1933.

A detailed account is given of the author's investigation of a disease of cultivated mushrooms (*Psalliota arvensis* and *P. campestris*) observed in 1922 in Kent. Its most conspicuous symptoms were the frequent deformity of the diseased mushrooms, which had shapeless or reduced caps, the edges of which were seldom capable of separating from the stipe, and the abnormally white colour, due to the presence of the white or greyish-white mycelium of a species of *Verticillium*. On mushrooms which were not deformed greyish-white patches of the mycelium were seen on the pileus, stipe, and gills. The disease differs from that caused by *Mycogone perniciosa* [*R.A.M.*, xii, p. 72] in the absence of exudations of brown liquid,

the less vigorous and flocculent growth of the superficial mycelium, and the considerably slower decomposition of the infected mushrooms which are firm and of a somewhat leathery consistency. The pathogenicity of the fungus was established under controlled conditions both to mushrooms grown in beds and to cut mushrooms in the laboratory. In agar cultures it did not survive an exposure for six hours to a temperature of 40° C., this being considered to indicate that the casing soil of the beds is more likely to be the source of infection than the manure.

Morphologically the fungus is characterized by creeping, septate, hyaline, branched hyphae, 1 to 3 μ in diameter (4 to 5 μ at points of branching). The conidiophores are lateral or terminal, erect, septate, sometimes simple and 10 to 200 by 1·5 to 2 μ but generally verticillately branched and up to 910 by 1·5 to 5 μ. The secondary branches are usually septate at the base, rarely with an additional septum in the middle, arising in whorls, and 20 to 40 by 2 to 3 μ, tapering to 1 μ at the tip. The whorls are one to ten in number on the main axis, and are composed of 2 to 12 branches which are usually simple, rarely with secondary whorls. The conidia are oblong or cylindrical, occasionally irregularly fusoid, with obtuse ends, continuous, and 3 to 16 by 1·5 to 5 μ (average 6·6 by 2·5 μ). They are abstricted singly at the tip of the branch, but remain clustered with mucilage in globular masses, 4 to 14 μ in diameter, which swell and dissociate in water. The species agrees closely with G. T. Malthouse's incomplete description in 1901 of a *Verticillium* causing a disease of mushrooms in Edinburgh (*Trans. Edinburgh Field Naturalists' and Microscopical Soc.*, iv, 3, 1901), and the name *V. malthousei* is proposed for it. A Latin diagnosis is appended.

Infection experiments showed that deformation of the mushrooms only results when they are infected in the earliest stages of their growth, while infection at later stages causes local lesions, such as the typical spotting of the pilei and stipes.

Among the recommendations for control are the suppression of insects in the mushroom houses since there was evidence that insects could help in disseminating the conidia, the reduction of air temperature to between 50° and 55° F., removal of all diseased specimens, and watering of the beds only after the removal of the diseased mushrooms. Steam sterilization of the casing soil may be tried as a preventive measure.

Imai (S.). **On the taxonomy of nameko fungus in Japan.**—*Bot. Mag.*, Tokyo, xlvii, 557, pp. 384–389, 1933. [Japanese, with English summary.]

'Nameko' is the common local Japanese name for a group of at least six highly appreciated edible fungi, including *Collybia velutipes* [*R.A.M.*, xii, p. 44], *Pholiota adiposa*, *P. mutabilis*, *Flammula lubrica*, and *F. lenta*, all of which have gelatinous pilei. In 1929 T. Ito described *C. nameko*, a comparison of which with a species of *Pholiota* popularly known as 'nameko' showed that the two are identical. The name *C. nameko* is therefore changed to *P. nameko* (T. Ito) S. Ito et Imai, with a Latin diagnosis.

Garbowski (L.) & Juraszkówna (Mme H.). **Choroby roślin użytkowych w okresie 1926-1930. Zestawienie notowań Zakładów Ochrony Roślin.** [Diseases of useful plants in the period 1926 to 1930. A summary of the reports of the Plant Protection Stations.]—*Rocznik Ochrony Roślin* [*Plant Protection Yearbook*], Bydgoszcz, Sect. A, i, pp. 97–235, 1933.

This is a very briefly annotated list [arranged by the hosts] of the more important bacterial, fungal, and virus diseases, and physiological troubles of cultivated or wild plants and trees of economic or ornamental value, which were reported by the various Plant Protection Stations of Poland in the period from 1926 to 1930, inclusive, and among which the following may be mentioned. Yellow leaf spot (*Cercospora concors*) [*R.A.M.*, x, p. 76] was very widespread on potatoes in the province of Poznań in 1929 and 1930. In 1929 sugar beets in one locality were heavily attacked by scab (*Actinomyces* sp.); in the other years minor outbreaks of *Bacillus tabificans* [ibid., vi, p. 147] and of *Bacterium scabiegenum* [ibid., x, p. 293] occurred locally on this host. Other records include smut (*Urocystis cepulae*) [ibid., xii, p. 610] and bacteriosis (*Bacillus cepivorus*) [ibid., vi, p. 466] of onion; bacterial crown rot (*Bacterium rhaponticum*) [ibid., iii, p. 629] of rhubarb; *Alternaria brassicae* var. *somniferum* Br. et Cav. on opium poppy; *Oospora lactis parasitica* [ibid., viii, p. 140], *Macrosporium* [*Alternaria*] *tomato* [ibid., xii, p. 662], and *Phytobacter lycopersicum* [ibid., x, p. 494] on tomato; *Pythium aphanidermatum* on cucumber; *Pseudomonas* [*Bacterium*] *juglandis* [ibid., xii, p. 338] on walnuts; *Rhabdospora ramealis* var. *macrospora* [cf. ibid., viii, p. 288], *Coniothyrium fuckelii* var. *rubi*, *Coryneum ruborum* [ibid., vi, p. 738], *C. rubi*, and *C. microstictum* [ibid., vii, p. 700] on raspberry; and *Pseudomonas syringae* [ibid., xii, p. 26] on the lilac. The paper terminates with a full index of the Latin names of the organisms mentioned.

Administration Report of the Director of Agriculture, Trinidad and Tobago for the year 1932.—58 pp., 1933. [Received February, 1934.]

In 1932 witches' broom (*Marasmius perniciosus*) of cacao in Trinidad [*R.A.M.*, xii, p. 143] was reported on 3,800 properties, totalling 130,000 acres out of the 200,000 under cacao in the island, as against 2,454 the previous year. Prolonged wetting followed by high atmospheric humidity and protection from light and heat most favoured the formation of sporophores. Sporophores appear to be very rarely produced on leaves, only two appearing on 13,290 leaves tested after exposure to conditions favourable to natural infection. In inoculation tests no infection of dormant buds was obtained under conditions that gave 54 per cent. infection of active ones [ibid., x, p. 658]. The incubation period in the latter (to first appearance of symptoms) was 21 to 52 days. Even when dormant buds were taken from trees with about 400 brooms or infected cushions on each and were budded on to healthy stocks in a disease-free area the 15 that succeeded gave only healthy shoots.

The two chief rainy periods normally set in in June and November and it is recommended that special efforts should be

made to remove all brooms and excise the diseased tissues twice annually, in May and October, in order to check sporophore production. Spore trapping experiments showed that aerial dissemination was occurring in heavily infected areas in June, before the onset of the rains. As the incubation period varies from 3 to 8 weeks, the maximum number of new brooms appears in the dry season following the rains (at Marper experimental estate 50 per cent. occurred during the main flushing season in February and March and 20 per cent. during the Indian summer flush in late autumn), but it is concluded that new infections can also take place during the dry seasons, when there are heavy showers from time to time.

While the loss in yield for Trinidad as a whole is not yet very appreciable, one grower reported that about 25 per cent. of his mature pods were attacked.

Spraying and dusting experiments with agrisol, amberene, Cooper's fungicide, Bordeaux mixture, vermorite, Cooper's bordinette, kolodust, kolokil, olite sulphur, and cupryl powder gave no very pronounced degree of control, while different fertilizers did not appear to affect the incidence of infection.

On the experimental Marper estate all diseased tissues were cut out and burnt every month. The total number of diseased tissues found was 213,023, or 2,287 per acre, a decrease of 15 per cent. on 1931 [ibid., xii, p. 143]. The total cost for the year, including supervision, was $7·45 per acre [= approximately £1 10*s.* at par.].

A critical study was begun of the conditions under which bronze leaf wilt of coco-nuts [ibid., xii, p. 143] occurs on certain selected estates, and the evidence so far obtained suggests that in some cases the disease may be due to destruction of the roots in waterlogged soil during the rainy season, with the consequent upsetting of the balance between root absorption and leaf transpiration during the dry season.

Among miscellaneous records the following may be cited, Tonca [or Tonquin] beans (*Dipteryx odorata*), now widely planted in Trinidad, were found in two localities attacked by a thread blight due to a *Corticium*. Withertip and blossom blight of limes (*Gloeosporium limetticolum*) [loc. cit.] was very prevalent, the crop on some estates being only one-quarter of the normal amount. Considerable damage was caused by a stem rot of rice apparently due to *Sclerotium oryzae* [see below, p. 322].

HANSFORD (C. G.). **Annual Report of the Mycologist, 1932.**—*Ann. Rept. Dept. of Agric. Uganda, for the year ended 31st December, 1932* (Part II), pp. 55–56, 1933.

In this report [cf. *R.A.M.*, xii, p. 421] it is stated that some of the new strains of cotton grown in breeding plots in Uganda show signs of being highly resistant to blackarm (*Bacterium malvacearum*), several strains now growing at Serere being much more resistant than S.G. 29, the variety extensively grown in the Eastern Province.

In an Appendix a full account is given of experiments carried out at Serere and Bukalasa, one of which, made to study the effect of various seed treatments on the amount of angular leaf spot and

blackarm that developed and also on the yield, consisted of two Latin squares side by side, each containing 16 sub-plots [cf. ibid., xiii, p. 161]. The treatments used were (1) delinting with sulphuric acid and then applying mercuric chloride solution *in vacuo*, (2) soaking in a culture of *Bact. malvacearum*, and (3) dusting with Dupont granosan, one lot of seed being left untreated as a control. A second test made to ascertain the relationship between the spread of angular leaf spot and the prevailing climatic conditions and to establish, if possible, a correlation between yield and the duration of infection consisted of a square of 55 by 55 holes spaced 3 by 3 ft., in the centre of which a square of 3 by 3 holes was sown with seed soaked in a culture of *Bact. malvacearum*, the rest of the plot being planted with seed sterilized by delinting in sulphuric acid and treating *in vacuo* with mercuric chloride solution. A third experiment, made to compare various types of blackarm in respect of their effect on yield, consisted of three blocks of twenty rows each of 24 plants planted 3 by 3 ft. The treatments applied were (1) inoculation with *Bact. malvacearum* on the basal monopodia after they had attained a length of six inches and (2) cutting them off at a similar stage; a number of plants were selected because of natural infection on the main stem.

The results obtained [which are tabulated, expressed graphically, and discussed] demonstrated that the stem form of blackarm significantly affected both yield and stand, while the leaf form of the disease had no effect upon yield. Dusting the seed with granosan increased the rate and percentage of germination and heightened the resistance of the plants to adverse conditions throughout the season. Seed inoculation with *Bact. malvacearum* reduced the stand, presumably because the early and heavy infection set up killed the young seedlings. The rate of spread was found to be closely correlated with rainfall, this factor being apparently that which has the greatest effect upon the cotton plant. Other climatic factors are so closely correlated with rainfall that their individual influence upon the spread of the disease cannot be determined. The direction of spread at Serere was roughly with the prevailing wind in situations where surface rain wash was prevented; the effect of surface rain wash was to modify or even obliterate the directional effect of rainstorms. The most important influence on yield in the tests was the extent to which the basal monopodia were developed. Early attack by *Bact. malvacearum*, if it occurs in such a way as to hinder the normal development of the monopodia, is likely to lead to severe damage with a resultant heavy loss of crop.

Dolichos lablab was very severely attacked by an unidentified fungus probably related to *Sphaceloma citri*. Lucerne was badly attacked at Serere by *Uromyces striatus* [ibid., ix, p. 187], while a considerable proportion of the plants were killed by *Sclerotium rolfsii*; this crop is not likely to be of much value in Uganda.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements. List of intercepted plant pests (List of pests recorded during the period July 1, 1932, to June 30, 1933, inclusive, as inter-

cepted in, on, or with plants and plant products entering United States territory).—pp. 2–3, 1934.

Among other interceptions made by officials of the plant quarantine administration of the United States Department of Agriculture during the period from 1st July, 1932, to 30th June, 1933 [cf. *R.A.M.*, xii, p. 335], the following may be mentioned: potato wart (*Synchytrium endobioticum*) in tubers from Bolivia and Peru [ibid., xi, p. 226]; a smut (*Polysaccopsis hieronymi*) on potato tubers from Venezuela; *Mycosphaerella pinodes* [ibid., xii, p. 740] on peas from Brazil and Japan; *Phyllosticta pisi* on peas from Germany; *M. rathayi* on grapes from Italy; and *Septoria ornithogali* var. *allii* on leeks (*Allium porrum*) from France.

Klein (G.) & Ziese (W.). **Beiträge zum Chemismus pflanzlicher Tumoren. IV. Mitteilung: Über Peroxydase in pflanzlichen Tumoren.** [Contributions to the chemistry of plant tumours. Note IV: on peroxidase in plant tumours.]—*Biochem. Zeitschr.*, cclxvii, 1–3, pp. 22–25, 1933.

A tabulated account is given of the writers' determinations of the peroxidase content of healthy horse-radish rootstocks in comparison with that of those bearing tumours resulting from inoculation with *Bacterium tumefaciens* [*R.A.M.*, xii, p. 148]. It was found that the average peroxidase activity of the tumours (expressed by the amount of purpurogallin in the ether after extraction of the macerated root solutions with the admixture of 5 gm. pyrogallol and 50 mg. hydrogen peroxide by Willstätter's method) was more than double that of the other portions of the rhizome. The peroxidase activity of the healthy parts of tumour-bearing rhizomes was found to be comparable with that of normal material, indicating that the influence of the neoplasm does not extend beyond its immediate limits.

Ciferri (R.) & Parodi (E.). **Descrizione del fungo che causa la 'moniliasi' del Cacao.** [A description of the fungus causing 'moniliasis' of Cacao.]—*Phytopath. Zeitschr.*, vi, 5, pp. 539–542, 3 figs., 1933.

According to Rorer (*Informe Dept. Com. y Agric. E. U. N. America*, 13 pp., 1926), the cacao yield in an Ecuador plantation of 35,000 trees sank from 76,050 lb. in 1917 (when the disease was first seen in the country) to 22,916 in 1918 and 3,650 in 1919, followed in 1920 by the abandonment of the estate, in consequence of the *Monilia* disease [*R.A.M.*, xi, p. 434], which also occurs in Colombia [ibid., ix, p. 437]. Material sent from Guayaquil by the junior author was examined at the Palermo Botanical Institute by the senior writer.

The spots covering the fruits in part or completely measure 5 to 70 mm. in diameter and are yellowish, bluish, or greyish, of irregular shape with indefinite margins sometimes with a pale edging, and darker centres. Black stripes occur on the pericarp corresponding to disturbances in the vascular system, the mesocarp and central rachid are brown to blackish, while the mucilaginous sheath and the seeds are soft and watery, finally disintegrating completely. The internal mycelium of the fungus is tortuous, profusely branched,

hyaline, guttulate, and 2 to 2·5 μ in diameter, and the aerial mycelium is so densely ramified as to form a pseudostroma on the surface of the spots, composed of interwoven hyphae, 4 to 5 μ in diameter, with more slender apical branches (2 to 3·5 μ) or occasionally enlarged to 6 or 7 μ. The undifferentiated, cespitose to quasi-fasciculate conidiophores may be simple but are usually bi- or trifurcate at the base (mostly the former), hyaline, pluriseptate, often inequilateral and more or less straight, but as a rule slightly and irregularly undulate, 9 to 50 μ in length, and of the same breadth as the hyphae. The conidia vary in shape, being spherical to sub-cylindrical, ellipsoidal or elliptical-apiculate, more often spheroidal to sub-ellipsoidal, forming simple or irregularly branched chains of 2 or 3 to 20 or more, 7·5 to 10 μ in diameter or 9 to 14 by 8 to 10·5 μ. Some affinity between the *Monilia* of cacao and *M. seaveri* Reade (*Ann. Mycol.*, vi, p. 122, 1908) is evident, but the conidia of the latter are subglobose to citriform and furnished with disjunctors, while those of the related *M. angustior* (Sacc.) Reade (loc. cit.) are considerably larger. The cacao fungus is accordingly named *M. roreri* Cif. n.sp., with an abbreviated Latin diagnosis.

GAILITIS (L.). **Latvia: the destruction of Barberry and Buckthorn.**—*Internat. Bull. of Plant Protect.*, vii, 12, p. 269, 1933.

In accordance with a law passed by the Latvian Parliament on 11th March and published in the official gazette, *Valdibas Vestnesis* 65, 20th March, 1930, barberries (*Berberis vulgaris* and its var. *atropurpurea*) and buckthorn (*Rhamnus cathartica*) should have been completely eradicated throughout Latvia, except where authorized for scientific purposes, by 20th March, 1933, with a view to the control of the cereal rusts, *Puccinia graminis* and *P. coronifera* [*P. lolii*].

STEINER (H.). **Über Braunrost- (Puccinia triticina und Puccinia dispersa) Infektionen an abgeschnittenen Getreideblättern.** [On brown rust (*Puccinia triticina* and *Puccinia dispersa*) inoculations on cut cereal leaves.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 12, pp. 673–682, 1 fig., 1933.

The incubation period of *Puccinia triticina* on the leaves of the winter wheat varieties Dioseger 777, Fleischmann 481, Bànkut, and Strubes Dickkopf and the summer Roter Schlanstedter, cut off at regular intervals before and after inoculation at the Institute of Agronomy, Vienna, was at least a day shorter under comparable conditions than on the control plants inoculated and left on the plants in the ordinary way. Very early removal (four days before inoculation) of the leaves, however, prolonged the incubation period by a day as compared with the controls. The later the leaves were removed from the plants, the higher was the incidence of infection, a direct correlation existing between the latter and the colour and physiological activity of the foliage. Similar experiments with *P. dispersa* [*P. secalina*: *R.A.M.*, xiii, p. 82] on Tyrnauer and Swedish rye showed that a slight curtailment of the incubation period followed the removal of the leaves after inoculation.

Gassner (G.) & Kirchhoff (H.). **Versuche zur Bekämpfung des Weizenflugbrandes mittels Benetzungsbeize.** [Experiments in the control of loose smut of Wheat by moistening.]—*Phytopath. Zeitschr.*, vi, 5, pp. 453–468, 2 figs., 1 graph, 1933.

In continuation of the experiments initiated by the first-named writer on the control of loose smut of wheat [*Ustilago tritici*] by moistening in closed vessels [*R.A.M.*, xii, p. 499], it was found that the best results were obtained by three to five hours' rotation of the seed-grain (Santa Fé variety) containers in a water bath at 50° C. The grain in the containers was moistened with 5 to 6 l. water per cwt. The addition of methylated spirit or isopropyl alcohol at low concentrations to the steeping water was found to enhance the efficacy of the treatment. By raising the temperature to 52·5° it is possible to curtail the duration of the treatment or reduce the quantity of liquid, whereas a drop to 47·5° necessitates a more protracted period and an additional amount of liquid added to the grain. In this series of trials the minimum length of time and quantity of liquid requisite for complete disinfection at 52·5° were three hours and 4·5 l. per cwt. grain, respectively. A slight diminution of the germinative capacity is a necessary sequence of the complete elimination of loose smut by this method, but less than has been reported for the ordinary hot water treatment. Further investigations on certain aspects of this line of control are in progress.

Roemer (T.) & Bartholly (R.). **Die Aggressivität verschiedener 'Steinbrandherkünfte' [Tilletia tritici (Bjerk.) Wint.] und ihre Veränderung durch die Wirtssorte.** [The aggressiveness of various 'bunt collections' [*Tilletia tritici* (Bjerk.) Wint.] and its modification by the host variety.]—*Phytopath. Zeitschr.*, vi, 5, pp. 469–506, 1933.

During the period from 1926 to 1932 the writers determined the degree of 'aggressiveness' [cf. *R.A.M.*, xiii, p. 262] of different bunt (*Tilletia tritici*) [*T. caries*] collections from Germany, Denmark, Switzerland, and the United States, and its modification by the host variety, the inoculations covering 364,582 wheat plants. The standard method of inoculation by heavy dusting of the seed-grain with bunt spores and subsequent planting in the open was found to give rise to serious discrepancies, and an improved method was therefore devised. The inoculated seeds were placed in earthenware dishes in damp soil, the moisture content of which was controlled by standing the dishes on roofing-paper and covering them with damp sacking and roofing-paper. One series of dishes was kept in the greenhouse and another in the cold frame. After four to five days the coverings were removed and after a further similar period the seedlings were planted out in the open. The lower temperatures of the cold frame were found to promote a higher incidence of infection than those prevailing in the greenhouse.

Continuing the experiments of Roemer (*Kühn-Arch.*, xix, 1, 1928), Gieseke, and Knorr [*R.A.M.*, viii, pp. 766–7], the six bunt collections of the above-mentioned origins were tested for their virulence on seven winter and six summer wheats (1931–2 only for the latter). Since 1927 the Cosel collection has consistently

proved the most aggressive, infecting even the relatively resistant Heils Dickkopf and Hohenheim 77 winter varieties to a maximum of 50·4 and 34·3 per cent., respectively, the corresponding figures for the semi-resistant Martin and Red Hussar being 77·3 and 49·6 per cent. The Breslau collection came next in order of aggressiveness, attacking the highly resistant Ridit more severely (4·9 to 11·8 per cent.) than any of the others. The Halle collection was found to be only moderately aggressive (except on Panzer III), and the foreign ones (especially that from the United States) showed comparatively weak aggressiveness. The Peragis summer variety proved highly susceptible in both years, the maximum infection in the cold frame in 1931 being 92·2 per cent. (American collection) and in 1932 89·5 per cent. (Halle). The Garnet and Vehandi (Finnish) varieties showed a fairly high degree of resistance in the former year, which was not maintained, however, in the latter. In both years selected hybrids of the Plant Breeding Station proved very resistant. In this connexion it is pointed out that the bunt collections used in the tests are mixtures and not 'pure lines', each collection comprising a population varying in aggressiveness towards the experimental material. It is incorrect, therefore, to apply the term 'physiologic races' to these collections.

Discussing the influence of a given variety on the bunt collection infecting it, the writer states that Hohenheim 77, for instance, exercises a selective capacity on the bunt population, developing lines from the Cosel collection which become progressively more virulent with every generation when tested on the same variety and Heils Dickkopf. This line of evidence is pursued at some length and considered to afford convincing proof of varietal capacity to modify the behaviour of the invading collections towards the same and other varieties.

GEACH (W. L.). **Foot and root rots of Wheat in Australia. The influence of the combined action of Fusarium culmorum (W. G. Sm.) Sacc. and Urocystis tritici Koern. on the occurrence of seedling blight.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 4, pp. 269–278, 1 pl. [opp. p. 308], 1933.

During the years 1930–1933 an unusual amount of seedling blight occurred at Canberra among wheat plants growing in a glass house in unsterilized soil from grain inoculated with *Urocystis tritici* in tests for varietal resistance to flag smut. Isolations from the affected plants gave *Fusarium* spp. (generally *F. culmorum*) or *Helminthosporium sativum*, or both. In an adjoining glasshouse, wheat plants grown from grain inoculated with *F. culmorum* or in soil inoculated with *H. sativum* were less severely and less consistently attacked. Further experiments showed that the more severe attack in the first house was due to the combined effect of the smut and the root-rotting organism.

When grain was inoculated with a mixture of spores of *U. tritici* and conidia of *F. culmorum* more seedling blight occurred than when the grain was inoculated with either organism alone, both in the field and in pots of sterilized or unsterilized soil. Only a comparatively small amount of seedling blight occurred in the same environmental conditions on plants from grain inoculated with

only *F. culmorum* or *U. tritici*. For instance, in one such pot experiment in sterilized soil, out-of-doors, taking the control as 100, the percentage loss from seedling blight in the plants inoculated with *U. tritici*, *F. culmorum*, and both together was 2, 8, and 54, respectively.

In the field, wheat varieties highly resistant to *U. tritici* were only comparatively resistant to seedling blight caused by the combined attack of *F. culmorum* and *U. tritici*. These two organisms acting together under ordinary field conditions are partly responsible for poor stands.

BROADFOOT (W. C.). **On the pathogenicity of Wojnowicia graminis.**—*Phytopath.*, xxiii, 12, pp. 1001–1002, 1933.

Inoculation experiments with 34 isolations of *Wojnowicia graminis* [*R.A.M.*, xiii, p. 154] on the Kharkov and Marquis wheat varieties in Alberta, Canada, showed no conclusive evidence of pathogenicity on the part of the fungus [cf. ibid., xii, p. 685]. Measurements were obtained of 100 spores from a pycnidium on a winter wheat plant, the average size being 36 by 3·9 μ, with a range from 26·3 to 43·8 by 2·5 to 5·6 μ; the septa numbered 3 to 8 (average 6·8). The corresponding dimensions given by Van de Laar in Holland [ibid., x, p. 446] are 29·58 by 3·47 μ, with 5 to 7 septa.

HYNES (H. J.). **'Purple patch' of Wheat and Oats. A disease caused by the fungus Rhizoctonia solani.**—*Agric. Gaz. New South Wales*, xliv, 12, pp. 879–883, 4 figs., 1933.

In recent years wheat and oats in a south-western district of New South Wales have been affected by a disease locally known as 'purple patch', due to *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, xii, p. 159]. The disease causes scattered unhealthy patches (purplish when viewed from a distance) which appear within three months of sowing and range from a foot in diameter to three-quarters of an acre or more in extent. The affected plants are stunted, stiff, erect, and show yellow and purple lower leaves. The primary and secondary roots are brown and extensively rotted. Many affected plants succumb when 2 to 5 in. high, while others may survive, but produce little grain. The disease is severest in winter, partial recovery sometimes occurring with the return of warm weather.

Inoculations with *C. solani* isolated from affected plants produced typical infection on wheat and oats. Barley and rye were also attacked with equal severity in the author's tests.

Very encouraging results were obtained in preliminary experiments on control by fertilizing with lime, sulphate of ammonia, or both together.

MACINDOE (S. L.), SHIRLOW (N. S.), & DARRAGH (W. H.). **Leaf or crown rust of Oats. Field observations on resistance of varieties.**—*Agric. Gaz. New South Wales*, xliv, 12, pp. 887–894, 2 figs., 1933.

In breeding tests conducted in New South Wales to obtain a variety of oats resistant to crown rust (*Puccinia coronata avenae*) [*P. lolii*], Victoria oats (of Argentine origin) [*R.A.M.*, xi, p. 498]

maintained complete immunity in three localities for three years. At one centre in 1933 several lines of Victoria × Richland showed very high resistance to black rust [*P. graminis*] with immunity from crown rust, while a White Russian selection, W 1950, also showed complete freedom from the latter. Bond (the result of a cross between *Avena sterilis* and Golden Rain) showed only 5 per cent. crown rust [ibid., xii, p. 269] but is a very late variety, susceptible to *P. graminis*.

Victoria, which is said to be possibly a hybrid between *A. sativa* and *A. sterilis*, and (to a less extent) Bond are considered to be the most suitable varieties to use in further crossing.

Hirschhorn (J.). **Dos royas de la Cebada, nuevas para el país.** [Two Barley rusts new to the country.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 38, pp. 166–167, 1932.

Two rusts were observed for the first time on barley in the Argentine in 1930, namely, *Puccinia anomala* and *P. glumarum* [*R.A.M.*, xi, p. 499], the former affecting the two-rowed varieties (*Hordeum distichon*) [ibid., x, p. 230] and the latter the four- and six-rowed (*H. tetrastichon* and *H. hexastichon*), as well as *H. spontaneum* and its var. *nigrum*.

Marchionatto (J. B.). **Las 'helmintosporiosis' de la Cebada en la República Argentina.** [The 'helminthosporioses' of Barley in the Argentine Republic.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 38, pp. 107–114, 1 pl., 1 fig., 1932.

Notes are given on the symptoms and etiology of three barley diseases occurring in the Argentine Republic, viz., net blotch (*Helminthosporium teres*) [*R.A.M.*, xii, p. 163], leaf stripe (*H. gramineum*), and spot blotch (*H. sativum*), with brief descriptions of the causal organisms. The existence of *H. teres* in the country is stated to have hitherto passed unnoticed owing to its confusion with *H. gramineum*.

Johnson (L. P. V.). **Studies on the inheritance of covered smut reaction, lemma color, awn development and rachilla pubescence in Oats.**—*Canadian Journ. of Res.*, ix, 6, pp. 519–541, 1933.

A fully detailed and tabulated account is given of the writer's studies at the University of Alberta on the reaction to covered smut (*Ustilago levis*) [*U. kolleri*: *R.A.M.*, xii, p. 562] and other characters of an oat cross, Black Mesdag × Victory. The F_3 was the only generation studied from the standpoint of smut reaction and the plants were grown from F_2 caryopses dehulled and inoculated with spores prior to sowing. Segregation for smut reaction among the F_3 families occurred in the ratio of 4 immune : 2 semi-resistant : 3 susceptible, and this is tentatively held to indicate that smut resistance is governed by two genetic factors—a dominant one, which when homozygous confers a high degree of resistance or

immunity and a weaker supplementary factor giving only partial resistance when homozygous.

Each of the grain characters, lemma colour, awn development, and rachilla pubescence, was found by a study of the F_2 and F_3 generations to be controlled by two genetic factors, but no correlation could be detected between these characters and smut reaction. Homozygous strains combining smut immunity with agronomically desirable grain characters were obtained.

The paper is supplemented by a bibliography of 42 titles and two appendices showing in tabular form the results of studies by previous workers on the inheritance in oat hybrids (A) of reaction to *U. kolleri* and *U. avenae*, and (B) of certain grain characters.

RENNERFELT (E.). **Undersökningar över strårötar hos våra sädesslag.** [Investigations on straw rots in our cereals.]—*Centralanst. för försöksväsendet på jordbruksområdet Medd.* 440, 16 pp., 1 pl., 2 figs., 2 graphs, 1 map, 1933. [German summary.]

The principal agents of foot rot among cereals in Sweden are stated to be *Ophiobolus graminis*, *O. herpotrichus*, *Leptosphaeria herpotrichoides*, and *Hendersonia herpotricha*, the last-named being particularly common on the stubble. It is characterized by spherical, black, somewhat setose pycnidia, usually furnished with a long ostiole and containing olive-green, slightly curved, generally 7-septate pycnospores which are often embedded in liquid and extruded in a large ball through a crack in the pycnidial wall or in a vermiform filament through the ostiole. The rapidly growing mycelium is greyish-green. The symptoms produced on wheat by *H. herpotricha* are similar to those caused by *O. graminis*, which is much less common in Sweden. *O. graminis*, *O. herpotrichus*, and *H. herpotricha* are all most prevalent on wheat but occur also on barley and rye (*O. herpotrichus* occasionally on oats). It has been suggested that *H. herpotricha* is the pycnidial stage of *O. graminis*, but no proof of this has been furnished. Species of *Fusarium* and *Pleospora* have also been found causing straw rots of cereals in Sweden. In most cases two or more of the above-mentioned fungi may be observed jointly attacking the plants.

H. herpotricha, like *O. graminis*, is most virulent on wheat following barley [*R.A.M.*, xiii, p. 154]. Among the alternate hosts of *O. graminis* in Sweden are timothy [*Phleum pratense*], couch grass [*Agropyron repens*], sweet vernal grass [*Anthoxanthum odoratum*], and *Calamagrostis* spp. As in Germany [ibid., xi, p. 361], the damage caused by *O. graminis* in Sweden is most severe on the lighter types of soil. Meteorological conditions play an important part in the development of foot rots, to which the crops are predisposed by a cool, wet late spring to early summer, conditions that prevailed in Sweden during the period 1927–9 and occasioned heavy losses from these diseases. The normal or low rainfall and warm early summers of 1930–2 coincided with a virtual absence of foot rots, except where *O. herpotrichus* was involved, this organism having a higher optimum (25° C.) than *O. graminis* (20°). The cereal foot rots are most widely distributed in Skåne, but are also found in other southern and central districts. Control measures are briefly indicated.

Wolff (F.). **Eine Laboratoriumsmethode zur schnellen Prüfung von Saatgutbeizmitteln (bes. zur Fusariumbekämpfung).** [A laboratory method for the rapid testing of seed-grain disinfectants (especially for *Fusarium* control).]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, x, 6, pp, 228–233, 3 figs., 1933.

A method has been devised for the rapid evaluation of the efficacy of seed-grain disinfectants, with special reference to those used against *Fusarium*, based on the observation of the germination and infection of rye seeds on Baltzer's starch-peptone-agar medium in Petri dishes inoculated by 30 minutes' immersion in a conidial emulsion of *Fusarium culmorum* [*R.A.M.*, x, p. 94]. From the second day after inoculation onwards, the mycelium of the fungus begins to spread over the insufficiently disinfected seeds, forming a dense, white aerial growth and turning the agar red, while the surface of the agar remains perfectly clear when the treatment has been effective. The use of an inferior disinfectant was shown to be accompanied by a serious reduction of germination.

Lepik (E.). **Rukki seemne puhtimisest.** [An experiment on the disinfection of Rye seed-grain.]—*Mitteil. Phytopath. Versuchsstat. der Univ. Tartu*, No. 15, 5 pp., 1 fig., 1 graph, 1933. [German summary.]

In 1933 there was a heavier outbreak than usual of flag smut of rye (*Urocystis occulta*) in Esthonia, and the author gives some details of a series of experiments in Tartu [Dorpat], the results of which showed that rye seed-grain, naturally infected with the smut, was stimulated to give a very high germination percentage when treated by the sprinkling process with 0·25 per cent. or by the short disinfection ('Ge-Ka-Be') process with 1·5 per cent. germisan, or by sprinkling with 0·33 per cent. uspulun. Steeping the grain in 0·125 per cent. germisan or in 0·25 per cent. uspulun, while a little more effective in the control of the smut, was less stimulating in regard to germinability, while dusting with ceresan, which gave complete smut control, did not improve at all the germination of the contaminated seed, which was of 'average' quality.

Ivanoff (S. S.). **Stewart's wilt disease of Corn, with emphasis on the life history of Phytomonas stewarti in relation to pathogenesis.**—*Journ. Agric. Res.*, xlvii, 10, pp. 749–770, 3 pl., 2 figs., 1933.

This is a detailed account of the author's investigation [cf. *R.A.M.*, xii, p. 364] of Stewart's wilt disease of maize (*Phytomonas* [*Aplanobacter*] *stewarti*), in which particular attention was given to the life-history of the causal organism in relation to pathogenesis. The results of experiments at the Wisconsin Agricultural Experiment Station showed that the bacteria enter the host plant through bruised and wounded roots in artificially infected soil, no evidence being found of their entry through the broken pericarp of the seed-grain at the time of germination or into uninjured

roots. In the leaves and cob sheaths the bacteria were found in the vessels and in cavities caused by their disruption, in the intercellular spaces and substomatal chambers, and between cells in the place of the dissolved middle lamellae ; all the tissues invaded were discoloured, plasmolysed, and dead. In the stem, peduncle, and cob rachis they were present in the vessels, in the large air spaces between some of the bundles, and in masses of disorganized pith. They were also observed in the whole vascular system of the tassels, and were isolated from the anthers and pollen of diseased plants. In infected maize grains they were located in the vascular system of the chalazal region, in cavities adjoining ruptured spiral vessels, between the outermost layer of the chalazal region and the aleurone layer, and between the cells of the endospermic tissue. The bacteria were further isolated from the exudate from all the diseased organs, as well as from the water which accumulated between the leaf blade and the ligule and at the base of young developing leaves. By employing a selective medium (glycerol 30 cc., ferric ammonium citrate 10 gr., sodium taurocholate 3 gr., sodium chloride 15 gr., sodium sulphate and dibasic potassium phosphate each 2·5 gr., calcium chloride 0·01 gr., magnesium sulphate 0·1 gr., agar 17 gr., and water to make 1 l., at P_H 7) the organism was recovered from overwintered maize stubble, decaying roots and stems, from the disintegrating parts of diseased seed-grains after germination in the soil, and from artificially infected soil.

Reddy (C. S.). **Resistance of Dent Corn to Basisporium gallarum Moll.**—*Iowa Agric. Exper. Stat. Res. Bull.* 167, pp. 4–40, 4 figs., 2 graphs, 1933.

This is a detailed account of the author's investigations into the resistance of Dent maize (*Zea mays* var. *dentiformis*) to *Basisporium gallarum*, an abstract of which has already been noticed [*R.A.M.*, xi, p. 448]. It is stated that the name *B. gallarum* is retained to cover the two species of *Nigrospora* reported on maize, *N. oryzae* and *N. sphaerica* [ibid., vi, p. 758], as both the small and the large spored forms were included in the tests, and the writer has some doubt whether they can be separated into distinct species on this basis alone.

Edwards (E. T.). **A new Fusarium disease of Maize. A preliminary note on the pathogenicity of Fusarium moniliforme (Sheld.) var. subglutinans Wr. & Rg., and on the occurrence of its hitherto unrecorded ascigerous stage, Gibberella fujikuroi (Saw.) Wr. var. subglutinans n. comb.**—*Agric. Gaz. New South Wales*, xliv, 12, pp. 895–897, 3 figs., 1933.

In May, 1932, perithecia of a *Gibberella* were collected on old maize stalks in New South Wales and found to contain straight, usually 1-septate ascospores with blunt, more or less rounded ends, apparently corresponding with Wineland's description of the ascospores of *G. moniliformis* [*R.A.M.*, xi, p. 222]. Similar material was collected from another locality a month later.

Cultural and morphological studies with single ascospore isolations showed, however, that the conidial stage was distinct from

Fusarium moniliforme and that it had close affinities with *F. moniliforme* var. *subglutinans*, with which it was later identified by Wollenweber, who reported that the perithecial stage of this fungus had not previously been described and suggested that it should be designated *G. fujikuroi* (Saw.) Wr. var. *subglutinans* n. comb. It differs from *G. fujikuroi* in having usually 8-spored asci, thinner ascospores, microconidia not in chains, and macroconidia smaller and less septate than those of *F. moniliforme* var. *majus*, the conidial stage of *G. fujikuroi*.

The pathogenicity of the organism on maize was established, and a survey showed it to be fairly widely distributed in the maize-growing areas of New South Wales. Numerous isolations demonstrated that the fungus is commonly carried internally in the grain.

This is thought to be the first record of *F. moniliforme* var. *subglutinans* as a parasite of maize.

KAMAT (M. N.). **Observations on Tolyposporium filiferum, cause of 'long smut' of Sorghum.**—*Phytopath.*, xxiii, 12, pp. 985–992, 4 figs., 1933.

Tolyposporium filiferum [*T. ehrenbergii*: *R.A.M.*, xi, p. 235], the agent of 'long smut' of sorghum in Tanganyika, Egypt, Mesopotamia (*Mesopotamia Dept. Agric. Admin. Rept. 1920*, 1921), and India, was studied on a number of standard liquid and solid media with special reference to its cultural characters and to the factors influencing germination of the spores.

Typical promycelia and sporidia were formed chiefly in the liquid media, especially sterilized distilled water, while on solid substrata branched germ-tubes giving off aerial conidia, either in long chains or in clusters at the tips of short, pointed, thorn-like branches, were commonly produced. The fusiform sporidia measured 8 to 24 μ in length and the aerial conidia 4 to 8 μ. The optimum temperature for spore germination was found to be about 28° C., 33° being almost as favourable; the minimum and maximum are 10° to 13° and just above 39°, respectively.

Considerable differences were observed between some of the monosporidial lines of the smut with regard to colony colour (pale cinnamon-pink, buff, or ivory-yellow), topography (raised, rugose, broadly or finely ridged, or furrowed), surface (dull or waxy), margin (wavy or lobate), consistency (membranous, leathery, or yeast-like), and diameter (37·5 to 50 mm.). Generally speaking, the membranous consistency, pale colour, regular margins, and fine ridging were associated with the higher temperature ranges.

MANDELSON (L. F.). **Citrus psorosis control.**—*Queensland Agric. Journ.*, xl, 6, pp. 504–507, 1 fig., 1933.

After stating that a suspected case of citrus psorosis was first observed in Queensland in 1927, since when the disease has been reported from five other localities in the State [cf. *R.A.M.*, x, p. 161], the author gives a brief, popular account of the disease and describes the Californian method of control by scraping away the

affected bark and painting the exposed surface with a mixture of 1 gall. concentrated lime-sulphur and 2 galls. lime paste (prepared by slaking 3 lb. quicklime in 1 gall. water) or with one made by slaking a known weight of quicklime while slowly sifting into it an equal weight of flowers of sulphur, stirring constantly, and adding enough water to make a smooth paste [ibid., xii, p. 89].

Zinc-lime as substitute for Bordeaux as brown rot spray.—*California Citrograph*, xix, 2, p. 53, 1933.

One season's experiments in California indicated that considerable control of citrus brown rot [*Phytophthora citrophthora*] is given by the zinc sulphate-lime spray proposed as a substitute for Bordeaux mixture [*R.A.M.*, xii, p. 690], provided the spray contains sufficient zinc. The strength recommended is 8–4–50 (8 lb. zinc sulphate, 4 lb. lime, and 50 galls. water), the sulphate employed being that with 7 molecules of water (i.e., 22·7 per cent. zinc). A prepared powdered zinc sulphate-lime mixture is also available.

Spraying should be effected after the first rain, and the whole tree may be thoroughly wetted.

Growers are warned against using too much zinc sulphate without lime as a neutralizing agent.

STOUGHTON (R. H.). **The influence of environmental conditions on the development of the angular leaf-spot disease of Cotton. V. The influence of alternating and varying conditions on infection.**—*Ann. of Appl. Biol.*, xx, 4, pp. 590–611, 1933.

The results of the controlled experiments described in this, the last instalment of this series [*R.A.M.*, xii, p. 22], indicated that, all other factors being equal, the development of primary infection of cotton seedlings by *Bacterium malvacearum* was chiefly governed by the mean soil temperature at the time of sowing and for the first few days of germination [ibid., vii, p. 95; x, p. 651], subsequent variations in this factor having little effect on the incidence of the disease. Primary infection was also found to be higher at soil moisture contents approaching the saturation point for a given type of soil, and to vary at a given soil temperature and soil moisture with the type of soil. The amount of secondary infection (by spraying the young cotton plants with a suspension of the organism) was shown to depend on the mean air temperature prevailing during the incubation period of the disease, the actual temperature at the time of inoculation being unimportant, while atmospheric humidity was important only during a short period (less than 48 hours) following inoculation, in that it controlled the time during which the infective droplets persisted on the leaves; variations in atmospheric humidity had little direct effect on the further progress of the disease after its establishment. Cotton plants kept in total darkness were relatively resistant to infection.

Fluctuating soil and air temperatures had the same effect in these experiments as a constant temperature near the mean of the variations, so that the latter figure can be used in studying the effect of temperature on the disease.

Kalandra (A.) & Rozsypal (J.). **Několik poznámek o puklici švestkové (Lecanium coryli) na Jasanech a na ní cisopasících houbách.** [A few notes on the Plum tree scale insect (*Lecanium coryli*) on the Ash, and on the fungi parasitizing it]—*Ochrana Rostlin*, xiii, 5–6, pp. 153–176, 2 pl., 1 fig., 1 map, 1933. [German summary.]

The main part of this paper deals with studies on the host range and control of the scale insect *Lecanium coryli*, which is stated to have occurred in epidemic form in pure and mixed ash (*Fraxinus* spp.) stands in Czecho-Slovakia from about 1922 to 1932. In the last two years, however, this pest has almost completely disappeared all over the country, presumably chiefly owing to biological control by numerous insect and fungal parasites. The two most important insectivorous fungi concerned have been determined as *Cordyceps pistillariaeformis* [*R.A.M.*, ix, p. 454] and *Cephalosporium* (*Acrostalagmus*) *lecanii* [ibid., ix, p. 33], morphological details of which are given. Both fungi chiefly attack young females just before the second moult, while the scale is still soft; males are very rarely attacked, owing to the protection offered by their thick scale. *C. pistillariaeformis* appeared to be most active during the spring and autumn, while *C.* (*A.*) *lecanii* killed most of the insects during the autumn, when it also infected the larvae. Artificial infection experiments in the greenhouse, in which young stages of the insect were either sprayed or brushed with spore suspensions of the two fungi, resulted in only a very few infections. In nature the mycelia and fructifications of both fungi, especially the still immature coremia of *C. pistillariaeformis* were seen to be destroyed in large masses by a mite (*Histiogaster* sp.), which is considered to be partly responsible for the almost total disappearance of these two species from the field in 1933.

Marchionatto (J. B.). **Nota sobre 'Sporotrichum globuliferum' Speg.** [A note on *Sporotrichum globuliferum* Speg.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 39, pp. 348–350, 2 figs., 1933.

Attention is drawn to the parasitic occurrence on migratory locusts [*Schistocerca paranensis*] in the Argentine of a new species of *Sporotrichum*, *S. paranense*, a full description of which is stated to be in the press. The fungus under observation, which was first observed by the writer in 1932, is stated to be distinguishable from *Beauveria globulifera* (*S. globuliferum*) [*R.A.M.*, xii, p. 217] by its morphological and cultural characters as well as by the mode of attack on the insects. The new species is characterized by green conidia, whereas those of *B. globulifera* are white and quite differently distributed on the conidiophores. The latter organism was first described from the Argentine in 1898 (*Informe Annual Ofic. Nac. Agric.*) on the basis of studies made by L. Bruner and C. F. Bessey in the previous year.

Ota (M.) & Kawatsuré (S.). **Sur le Sabouraudites ruber et ses variétés.** [On *Sabouraudites ruber* and its varieties.]—*Ann. de Parasitol. Humaine et Comp.*, xi, 6, pp. 476–501, 2 pl., 1 fig., 1933.

The authors state that comparative studies of material of various

origins showed that *Sabouraudites ruber* [*R.A.M.*, xii, p. 443] is highly variable in its morphological and cultural characters, for which reason it has been frequently described under other names, namely, *Epidermophyton rubrum* Castellani 1909 [ibid., xiii, p. 164], *Trichophyton purpureum* Bang 1910 [ibid., xii, p. 509], *T. rubidum* Priestley 1917 [ibid., xii, p. 569], '*T.A.*' Hodges 1921, *E. salmoneum* de Mello 1921 [ibid., xi, p. 44], *T. multicolor* de Magalhaes et Neves 1923 [ibid., vii, p. 376], *E. plurizoniforme* L. MacCarthy 1925, *E. lanoroseum* L. MacCarthy 1925 [ibid., x, p. 730], *Sabouraudites ruber* var. III Fuji 1932 [ibid., xii, p. 94], all of which are considered to be synonymous with *S. ruber*.

Strains typical of *S. ruber* produce, besides simple sporiferous hyphae, pyriform aleuria and multilocular spindle-shaped bodies in culture. Pectinate bodies and intercalary or pediculate chlamydospores are also formed. The colonies may be purple, red, lilac, occasionally spotted with creamy or sulphur yellow or yellowish-green, while some strains always remain white, and are distinguished under the name var. *albus* Ota et Hashimoto 1930. Other strains lack the spindle-shaped bodies and are provisionally classed as var. *acloster*; this variety may be divided by the aspect of the cultures into such types as *kagawanensis* (or *ruber*), *coccineus, lilaceus, albus*, and the like. Notes are also given on certain species allied to *S. ruber*.

The authors state that they accept the suppression of the genera *Endodermophyton, Bodinia*, and *Grubyella* proposed by Langeron & Milochevitch [ibid., x, p. 243].

LEBASQUE (J.). **Les champignons des teignes du cheval et des bovidés.** [The fungi of equine and bovine ringworms.]—Thèse Doct. ès Sci. Nat., Paris, 1933. [Abs. in *Bull. Inst. Pasteur*, xxxii, 2, pp. 69–70, 1934.]

As already shown by Brocq-Rousseu and his collaborators, equine dermatomycosis is due predominantly to *Microsporon* (*Sabouraudites*) spp. [*R.A.M.*, v, p. 555], whereas *Trichophyton ochraceum* [ibid., vi, p. 484] was found to be responsible for 53 per cent. of the bovine cases examined.

Four new species are described, namely, *Sabouraudites lanatus* and *T. bullosum* on horses, *T. villosum* and *T. papillosum* on cattle.

The occurrence of 'vrilles' [terminal spirals] has been demonstrated in *S. equinus* (*M. equinum*) and *T. equinum* [ibid., x, p. 243]. The cattle parasites, *T. album* [ibid., xi, p. 374; xii, p. 219], *T. discoides, T. ochraceum*, and *T. papillosum*, as well as *T. bullosum* from horses, all characterized by smooth colonies on Sabouraud's medium, produce a downy growth on barley and wheat grains and on droppings [cf. ibid., vii, p. 720], and develop certain morphological characters (*Acladium* conidial type or cruciform branches, spindles, and sometimes 'vrilles') not hitherto observed in the smooth dermatophytes. There are thus no grounds for maintaining the distinction between the downy and smooth species of *Trichophyton*, the latter falling naturally into the family of Gymnoascaceae as proposed by Langeron and Milochevitch [ibid., x, p. 242]. In the writer's opinion, the bovine ringworm fungi

live as saprophytes on grains and refuse and can infect young animals from these sources during the winter quite apart from contact with a diseased subject.

Empey (W. A.) & Vickery (J. R.). **The use of carbon dioxide in the storage of chilled beef.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 4, pp. 233–243, 1933.

Frozen meat supplied to Great Britain from Queensland, which furnishes about 85 per cent. of the Australian exports, is some 60 days from slaughter to arrival as against about 25 days from countries supplying chilled beef, and if freezing is to be avoided means must be found to check the proliferation of bacteria and moulds on the superficial tissues at temperatures above the freezing point (which is −1° C. for beef) as deterioration is almost wholly due to these.

The percentage of 'low temperature micro-organisms' (i.e., organisms capable of comparatively rapid growth at about −1°) was determined by comparing the numbers of superficial organisms from beef viable on artificial media at incubation temperatures of 20° and −1°. The low temperature bacteria found initially on the beef consisted of at least 95 per cent. of types belonging to *Achromobacter*, the remainder being species of *Pseudomonas* and *Micrococcus*. In all the tests the counts of low temperature moulds obtained immediately after slaughter and after the completion of chilling were extremely low compared with the counts of low temperature bacteria. In one test, after 42 days' storage, no visible mould was present on beef stored in atmospheres of 10 to 12 per cent. carbon dioxide [cf. *R.A.M.*, xiii, p. 97], whereas beef stored in air had an average population (per area of 2 sq. cm.) of 50 to 60 colonies, mostly *Penicillium expansum*, though *Sporotrichum carnis* was also present. Quarters of beef stored in 12 per cent. carbon dioxide even for 55 days showed only 3 or 4 colonies per quarter, all of *S. carnis*.

To restrict microbial growth on stored chilled beef the temperature should be maintained as near as possible to the freezing point of the muscle tissue, i.e., −1°. The use of 10 to 12 per cent. carbon dioxide in the storage atmosphere increased the storage life of chilled beef from meat-works where the initial contamination consists chiefly of *Achromobacter* by 40 per cent., as compared with storage in air, effectively controlled *P. expansum* and most other meat moulds, and moderately restricted the growth of *S. carnis*.

Groom (P.) & Panisset (Thérèse). **Studies on Penicillium chrysogenum Thom, in relation to temperature and relative humidity of the air.**—*Ann. of Appl. Biol.*, xx, 4, pp. 633–660, 1933.

The authors state that the mildew which in most cases affects book materials preserved at the Public Record Office, London, was found to be caused by a species of *Penicillium* which they determined in accordance with Thom's classification ('*The Penicillia*') [*R.A.M.*, ix, p. 410] as *P. chrysogenum*. Controlled experiments [details of which are given] showed that the conidia of this fungus germinate in atmospheres with a relative humidity ranging from

100 to 81 per cent., and at temperatures from 1° to above 35° but below 40° C., with an optimum at about 26°. In atmospheres with a relative humidity of 0 and 26 per cent. the conidia survived exposure to a temperature of 30° for over 129 days; at constant temperatures above 40° the time required to kill them was found to decrease with the rise of relative humidity, while at the same relative humidity it decreased with a rise in temperature.

GUTNER (A. S.). Грибы — паразиты оранжерейных растений городов Ленинграда и Детского Села. [Fungal parasites of glasshouse plants in the towns of Leningrad and Dyetskoye Selo.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Leningrad, Ser. II (*Plantae Cryptogamae*), *1933*, 1, pp. 285–323, 2 pl., 1933. [German summary.]

An annotated list is given of some 120 species of fungi (arranged in alphabetical order of the scientific names of the hosts) which were found in 1929–30 parasitizing glasshouse plants in Leningrad and Dyetskoye Selo. Of the thirty species (including one belonging to a new genus, *Diplochorina*) which are described as new to science, and of which the Latin diagnoses are given, the following may be mentioned. *Septogloeum amarylli* causes elongated, diffuse, wine-coloured spots on *Hippeastrum* leaves, which are eventually killed; it forms submerged, gregarious acervuli, 90 to 150 μ in diameter; the spores are oblong or irregularly elongated, hyaline or greenish, indistinctly one- to three-septate, and 7·5 to 18 by 3 to 4·5 μ. *Guignardia araliae* produces on dead branches of *Aralia pulchra* spherical, dark brown, ostiolate perithecia, with clavate, sessile, or subpedicellate asci, 60 to 72 by 9 to 11·2 μ in diameter; the ascospores are distichous or subdistichous, elongated, frequently inequilateral, curved, with obtuse ends, tapering towards the base, and 15·4 to 19·2 by 3·2 to 4·9 μ. *Gloeosporium aruliae*, on the same substratum, forms gregarious, elliptical, brownish-red, subepidermal acervuli; the spores are greenish, clavate, elongated or irregular, and 12·8 to 13·4 by 4·8 to 7·2 μ. *Vermicularia araliae* was found on shed leaves of *Aralia* spp. forming round, setose, black, hypophyllous (occasionally epiphyllous) acervuli, with subulate, dark brown, septate setae, swollen at the septa, and 225 to 315 by 4·5 μ in diameter; the spores are continuous or two-celled, greenish, sickle-shaped, with pointed or obtuse ends, and 19·2 to 27 (rarely 35) by 3·2 to 4·5 μ. *Guignardia dracaenae* forms on living leaves of *Dracaena latifolia* numerous elliptical, greyish or yellowish, frequently confluent spots, 1·5 to 6 by 0·8 to 1·5 cm. in diameter, with a thick, raised, light brown margin; the affected tissue eventually dies and falls out. The perithecia are amphigenous, submerged, spherical, black, and 100 to 120 μ in diameter. The asci are sessile, spindle- or club-shaped, frequently curved, and 48 to 54 by 9 μ; the spores are oblong, inequilateral, tapering towards the base, greenish, distichous or subdistichous, and measure 15 to 18 by 4·5 μ. *Phyllosticta oleandri* causes on living leaves of *Nerium oleander* diffuse, irregular, concentrically zoned, at first greenish but later greyish spots. The pycnidia are epiphyllous, disposed in concentric rings, black, and 270 to 300 μ in diameter. The spores are ellipsoidal or ovate, and 3·7 to 6 by 2 to 3 μ.

Ascochyta laurocerasi forms on the living leaves of *Prunus laurocerasus* large, shapeless, brown spots extending over the greater part of the blade. The pycnidia are dispersed, epiphyllous, submerged. The spores are elliptical, bacillar, hyaline, straight, indistinctly one-septate, rounded at both ends, and 6 to 10 by 2·2 to 3 μ. The paper terminates with an index of all the species recorded.

Taubenhaus (J. J.) & Ezekiel (W. N.). **A new Hollyhock rust.**—*Mycologia*, xxv, 6, pp. 509–512, 3 figs., 1933.

Hollyhocks in Texas were severely attacked in 1932 by a rust, the pustules of which occurred in profusion on all parts of the leaves, petioles, flowers, seed bracts, and seeds. Sori resulting from secondary infection were formed in concentric circles surrounding the older, central sori. The pustules were covered by a thin, mildew-like growth consisting of promycelia and sporidia from the germinating teleutospores, which were mostly uni-, occasionally bicellular and quite distinct from those of the common hollyhock rust, *Puccinia malvacearum*, the symptoms caused by which are also different [*R.A.M.*, x, p. 259]. The causal organism was identified as *P. heterospora*, known to occur on other Malvaceae in California, South America, and the West Indies, but apparently not hitherto recorded on the hollyhock. The fungus has previously been observed in Texas on *Sida* spp. and its sudden appearance on hollyhocks may indicate the development of a new physiologic form. Inoculation experiments on healthy hollyhock plants gave positive results.

Rudorf (G.) & Job (Maria M.). **Noticias sobre una bacteriosis en cultivos de Alhelies 'Matthiola incana' var. 'annua'.** [Notes on a bacteriosis in plantings of Stock (*Matthiola incana* var. *annua*).]—*Physis (Rev. Soc. Argentina Cien. Nat.)*, xi, 38, pp. 122–127, 4 figs., 1932.

Stock (*Matthiola incana* var. *annua*) plants at the Phytotechnical Institute of Santa Catalina, Argentine Republic, were observed in July, 1931, to be affected by a bacterial disease characterized by a yellow to coffee-coloured discoloration and rolling of the leaves and a longitudinal cracking of the stems, sometimes involving not only the cortex but also the central cylinder. Plants attacked in the juvenile phase are stunted; the development of the floral racemes is retarded and the rachids shortened, while the leaves surrounding the inflorescences are generally folded. The root system presents no apparent abnormalities, but the yellow liquid in the wood vessels of the roots, stem, and leaves contains bacteria. Infected stems turn black and the wood vessels and pith become entirely disorganized, while the petiole, leaf veins, and chlorenchyma are similarly involved.

According to Stapp in Sorauer's Handbook of Plant Diseases, Ed. 5, ii, p. 120, Briosi and Pavarino investigated a bacterial disease of *Matthiola* and wallflower (*Cheiranthus cheiri*) [in Italy], the symptoms of which correspond in all particulars with those described above. The Argentine disease is accordingly attributed to *Bacterium*

matthiolae Bri. & Pav. The Italian workers found that infection occurred through wounds in the roots, and the writers' observations and experiments at Santa Catalina supported their conclusion. Inoculation of the soil with suspensions of the causal organism in pure culture gave positive results. The most promising line of control appears to be the development of resistant varieties.

Gill (D. L.). **Plasmopara halstedii on Cineraria.**—*Mycologia*, xxv, 6, pp. 446–447, 1933.

Some 10 per cent. of the cineraria (*Senecio cruentus*) plants in a Long Island greenhouse were attacked in 1932 by a downy mildew which caused a considerable loss. The spots, up to about 3 cm. in diameter, are white on the under sides of the leaves and slightly browned on the upper. The diseased foliage soon dies. The conidiophores of the causal organism were 247 to 640 μ in length (mean $385{\cdot}44 \pm 8{\cdot}23\ \mu$) and the conidia measured 15 to 30 by 13 to 23 μ ($19{\cdot}67 \pm 0{\cdot}286$ by $16{\cdot}59 \pm 0{\cdot}199\ \mu$). These dimensions are rather smaller than those given by Wilson (*Bull. Torrey Bot. Club*, xxxiv, p. 387, 1907) for *Plasmopara halstedii* [*R.A.M.*, viii, p. 579] with which, however, the cineraria fungus (apparently a new record) is considered to be identical in view of its general morphological agreement. Specimens of *P. halstedii* from *Bidens frondosa* and *Rudbeckia hirta* were found to be clearly identical with the fungus observed on *S. cruentus*.

Christoff (A.). Една нова бактерийна болесть по Мака за опиумъ причинявана отъ **Bacillus (Erwinia) papaveri n. sp.** [A new bacterial blight of Opium Poppy caused by *Bacillus* (*Erwinia*) *papaveri* n. sp.]—Reprinted from *Journ. Agric. Exper. Stations in Bulgaria*, Sofia, v, 9–10, 31 pp., 8 pl., 1933. [English summary.]

This is a full account of the author's studies on the bacterial blight of the opium and other poppies in Bulgaria caused by *Bacillus* (*Erwinia*) *papaveri*, a preliminary report of which has already been noticed [*R.A.M.*, xi, p. 745]. On *Papaver somniferum* and *P. alpina* the disease was observed in the field, while *P. orientale* was successfully inoculated with it. Entry occurs through the stomata, and extension is chiefly through the intercellular spaces around the phloem and xylem parenchyma cells and the bast fibres. In addition to the information previously given, it is stated that the organism was shown to be very resistant to desiccation, retaining its viability on cover glasses kept dry in the dark for months on end; on potato agar it was found to be still infective to poppy at the end of three years. Its thermal death point was established at about 48° C.

The investigation showed further that the disease is distributed chiefly through infected seed, which is reached by the organism both from the stem and through the pod wall. The control measures recommended are the use of healthy seed, removal of diseased plants from the fields as soon as they appear, as well as of the stubble remaining from the preceding crop, and crop rotation, where practicable.

Buchwald (N. F.). **To for Danmark nye bakterioser paa prydplanter.** [Two bacterioses of ornamentals new for Denmark.] Reprinted from *Gartnertidende, 1933*, 45, 3 pp., 3 figs., 1933.

The organism recently isolated from Optima begonias in Denmark suffering from the bacteriosis reported some years ago on the Gloire de Lorraine variety [*R.A.M.*, viii, p. 752], and occurring sporadically since then, is named *Bacterium begoniae* n. sp. ad. int. It is rod-shaped and measures 1 to 1·5 by 0·5 μ. The general type of infection is closely similar to that caused by *Bact. campestre* [*Pseudomonas campestris*] on cabbage, the symptoms including a pale to leaden, water-soaked discoloration of the foliage, blackening of the leaf veins, and eventual wilting, accompanied by rotting of the stems from the base upwards. Judging by analogy, the pathogen probably enters the leaves through the marginal pores and the stems through basal wounds. Cultural measures for the control of the disease are briefly indicated.

Barberries (*Berberis vulgaris* and its var. *atropurpurea*, *B. canadensis*, and other varieties) were attacked in 1933 by *Phytomonas berberidis*, previously reported from the United States [ibid., xi, p. 109].

Hoog (J.). **The breaking of Tulips.**—*Gard. Chron.*, xciv, 2452, p. 471, 1933.

The discovery in 1675 by an English botanist named Balgrave that 'breaking' of tulips [*R.A.M.*, xii, p. 633] could be induced by grafting a portion of an affected on a sound bulb (*Gard. Chron.*, xciv, p. 391, 1933) is stated to have been anticipated in Holland. A book published at Haarlem in 1637, dealing with the tulip cult which reached its climax about that time, contains a dialogue between allegorical personages, one of whom explains how the desirable 'striped and feathered' effect may be obtained by placing a slice of a bulb possessing a flower with these characters in contact with a normal one from which a similar slice had been removed.

West (E. F.). **Another powdery mildew on Crape Myrtle.**—*Phytopath.*, xxiii, 12, pp. 1002–1003, 1933.

Since the writer's recent statement to the effect that *Erysiphe lagerstroemiae* is the only powdery mildew of which the perfect stage has been recognized on crape myrtle [*Lagerstroemia indica*] in the United States [*R.A.M.*, xiii, p. 168], specimens of *Phyllactinia corylea* [ibid., xii, p. 395] on mildewed leaves of the same host have been received from Alabama.

Curzi (M.). **L'Ascochyta heteromorpha n.c. nella necrosi dell'Oleandro e nell'inoculazione sperimentale.** [*Ascochyta heteromorpha* n.c. in Oleander necrosis and in experimental inoculation.]—*Boll. R. Staz. Pat. Veg.*, N.S., xiii, 3, pp. 380–426, 10 pl., 21 figs., 1933.

In this detailed description of a wilt and spotting of the young green shoots of oleanders (*Nerium oleander*) near Rome the author states that though generally only a few of the twigs and leaves are affected, sometimes nearly all the year's shoots are killed. Infection usually causes a small area of necrosis at the leaf axil,

the toxic products liberated by the fungus spreading along the midrib and the upper part of the twig, with the result that considerable areas develop necrosis without any actual invasion by the mycelium. The area of infection on the twigs shows light to dark brown, zonate spots; on the leaves direct infection causes large spots, whitish in the middle and chestnut or bay at the edges, usually showing concentric zonation. On the flowers and fruit infection generally starts at the peduncles and causes dark chestnut to nearly black, elongated, depressed spots. Attack is most injurious in autumn, atmospheric humidity favouring infection and greatly increasing the production and diffusion of the causal organism.

Hyaline to olivaceous or occasionally brown hyphae, 3·5 to 9 μ in diameter, permeate the tissues of the spots and produce light fuliginous, more or less immersed pycnidia, 110 to 200 μ in diameter, or if formed in a damp chamber 280 to 400 by 200 to 270 μ. The spores, which arise as bud-like outgrowths from the inner cells of the pycnidium, are hyaline, oval or piriform, biguttulate, and when mature may become 1-septate. Frequently, however, nearly all the spores in a pycnidium were continuous, though on fruits still attached to the trees and others kept in a damp chamber 60 and 3 per cent. of the spores, respectively, were septate. The spores range from 4 to 10 by 1·8 to 3·5 μ (when mature mostly 6·5 to 8 by 2·5 to 3·25 μ). The author refers the organism to *Ascochyta heteromorpha* (Sch. et Sacc.) n.c. (*Phoma ? heteromorpha* Sch. et Sacc , 1884, *P. oleandrina* Delac., 1905).

Artificial inoculations of oleanders either by sprinkling with an aqueous solution of the spores or by inserting pieces of mycelium under the bark gave positive results, the latter method causing the fungus to develop parasitically on 2- to 3-year-old branches, which escape natural infection. Inoculations of the young fleshy parts of about 70 [named] species of phanerogams also gave positive results, though the fungus was less virulent than on the oleander.

A bibliography of 25 titles is appended.

Bongini (Virginia). **Macchie di seccherecio delle foglie di Edera.** [Dry spotting of Ivy leaves.]—*La Difesa delle Piante*, x, 6, pp. 123–130, 1 pl., 1933.

All varieties of ivy (*Hedera helix*) in Italy, and especially *H. helix* var. *conglomerata* when grown under glass, are liable to severe injury from a disease characterized by dry, circular, depressed spots up to 2 cm. in diameter (surrounded by a raised brown margin visible only on the upper surface) on both surfaces of the leaves, but principally near the edge of the upper surface. These spots often coalesce and cover the whole blade, the leaf becoming yellow and thickened. Occasionally, they may spread to the peduncles and shoots.

The causal organism [the morphological characters of which are fully described] is *Colletotrichum trichellum* (Fries) Vogl. (syns. *Vermicularia trichella* Fries., *C. hederae* Pass., *C. hedericola* Laub., *Amerosporium trichellum* (Fries) Rostr.) [*R.A.M.*, viii, p. 268].

The paper terminates with brief notes on control and there is a bibliography of 18 titles.

Gross (J.). **Die Spitzendürre unserer Obstbäume.** [The tip die-back of our fruit trees.]—*Gartenflora*, lxxxii, 12, p. 351, 1933.

Attention is drawn to the prevalence of a virulent form of *Fusicladium* [*Venturia inaequalis* and *V. pirina*] on apple and pear trees in the Lake of Constance district and in the Grisons [Switzerland], the most prominent feature of which is a die-back of the branch tips. Care must be taken to avoid confusion between this disease and canker [*Nectria galligena*: *R.A.M.*, xi, p. 247], which frequently occurs on the same tree and even on the same branch. Among the apple varieties liable to this tip die-back are Luiken, Canada and Baumann's Pippins, and Winter Golden Pearmain, while the Pastor and other pears are similarly affected. Predisposing causes of infection are a high ground water level, impermeable, heavy or excessively light soils with an insufficient lime supply, a superabundance of nitrogen (especially from liquid manure), and various cultural errors.

Folsom (D.). **Apple spraying and dusting experiments 1928 to 1932 in relation to scab, yield, and tree growth.**—*Maine Agric. Exper. Stat. Bull.* 368, pp. 417–501, 6 figs., 5 graphs, 1933.

A detailed account is given of a comprehensive series of spraying tests conducted in Maine from 1928 to 1932, inclusive, against scab [*Venturia inaequalis*] on McIntosh apple trees, the effect of the various treatments on the leaves, fruits, stem growth, and yield being fully discussed [cf. *R.A.M.*, viii, p. 652].

A spray schedule not containing a mid-blossom and a 6-week application was weak in scab control. Flotation sulphur proved inferior to dry lime-sulphur in scab control but caused less injury to leaves and fruit. The replacement of lime-sulphur by calmosul (containing about 65 per cent. calcium monosulphate), at the rate of 6 lb. in 50 galls., after bloom was disadvantageous (71 per cent. scabbed fruits). The addition of iron sulphate to lime sulphur at the calyx and 2-week applications proved slightly beneficial in reducing leaf and fruit scab and spray injury in 1931, and when included in the 2-, 4-, and 6-week applications in 1932 was decidedly advantageous. The amount of leaf scab present in June was found to influence that found in July, which in turn largely determined that in August; the amount of leaf scab also governed the amount of fruit scab. Storage scab appeared to be reduced to insignificant proportions by late spraying in August. Twig infection was prevalent in some seasons, and spread from the twigs to the leaves was not prevented by dormant spraying with lime-sulphur or an oil spray.

In discussing the effect of the different applications on growth and yield [full data on which are given] the conclusion is reached that the effect of lime-sulphur spray injury upon these may be much less than is commonly supposed, especially in comparison with the effects of soil variation or of uncontrolled scab. In some cases the most injured trees had the best yield, presumably because of most effective scab control.

Growers in Maine in order to secure the best control of scab on McIntosh trees without russeting or reduction of yield are recommended to use lime-sulphur in preference to the other materials tested.

A 7-page bibliography is appended.

Cheal (W. F.). **Apple scab spraying experiments in the Wisbech area: the times of application. II.**—*Journ. Min. Agric.*, xl, 9, pp. 805–808, 1933.

During the very dry season of 1933 four plots of Emneth Early (Early Victoria) apples growing in the Wisbech area of Cambridgeshire were sprayed against scab [*Venturia inaequalis*] with lime-sulphur as follows: plot 1, at the 'green flower' stage [*R.A.M.*, xii, p. 452], pink bud, petal fall, and two or three weeks later; plot 2, as the preceding, but omitting the final application; plot 3, unsprayed; plot 4, at pink bud, petal fall, and two or three weeks later. The concentration used was 1 in 30 for the pre-, and 1 in 60 for the post-blossom applications, lead arsenate being added at petal fall.

When the apples were gathered, the percentage of scab in the four plots was, respectively, 0, 0·6, 10·9, and 3·7, demonstrating that in the locality concerned spraying at the green flower stage is advisable even in an exceptionally dry period.

Bliss (D. E.). **The pathogenicity and seasonal development of Gymnosporangium in Iowa.**—*Iowa Agric. Exper. Stat. Res. Bull.* 166, pp. 339–392, 8 pl., 11 figs., 2 graphs, 1933.

Of seven species of *Gymnosporangium* occurring in Iowa only *G. juniperi-virginianae* and *G. globosum* [*R.A.M.*, xii, pp. 452, 704] are common. The latter is of small economic importance, but the loss caused by an epidemic of the former in the apple crop in 1928 is estimated at $200,000.

Air-dried galls bearing teleutospores of *G. juniperi-virginianae* soaked in water for periods ranging from 30 to 180 minutes required 6 to 7 hours to produce abundant sporidia. The newly matured aecidiospores collected in July gave 54 per cent. germination on being tested immediately. The germination was increased by keeping at a low temperature (5° to 13° C.) during 22 days, while that of spores kept at room temperature dropped to zero in the same period.

The interval between infection and the first opening of the aecidia of *G. juniperi-virginianae* on *Pyrus ioensis* var. *plena* was about 72 days, and that for *G. globosum* on *Crataegus mollis* about 81 days.

Juniperus virginiana seedlings were successfully inoculated with the aecidiospores of *G. juniperi-virginianae* from *P. ioensis* var. *plena*, the wide variation in the number of galls developing from identical inoculations suggesting that red cedar seedlings may vary in disease resistance. *J. scopulorum* is the only other teleuto host known in Iowa.

The percentage of apple leaves infected by *G. juniperi-virginianae* varied roughly with the percentage of diseased leaf area as measured by an infection chart [which is described and figured].

Judged by the latter percentage 20 varieties are classed as very susceptible, 25 as susceptible, 73 as resistant, 18 as very resistant, and 2 as apparently immune. Evidence was obtained suggesting that the period of susceptibility in leaves of susceptible varieties is longer than in those of resistant ones.

Artificial inoculations showed that Tolman and York Imperial apples were highly susceptible to a strain of *G. juniperi-virginianae* from Morgantown, West Virginia, but were resistant to other strains from Iowa, Kansas, and Wisconsin, indicating the existence of physiological specialization within the species. There was little evidence that trees of any one apple variety show different degrees of resistance in different localities. Observations on varieties of known parentage suggest that the factors for resistance are transmitted genetically. Of the species of *Pyrus* other than the apple tested, only *P. ioensis* proved susceptible, the others being either resistant or immune.

None of the varieties of apple or crab apple grown in Iowa appears to be susceptible to *G. globosum*.

Stevens (N. E.). **Two Apple black rot fungi in the United States.** —*Mycologia*, xxv, 6, pp. 536–548, 1 map, 1933.

The writer discusses the evidence leading to the generally accepted conclusion that Berkeley's *Sphaeropsis malorum* and the *Sphaeropsis* commonly found in Oregon on apple and pear are identical with each other but not with Peck's species of the same name (transferred by Saccardo to *Phoma* as *P. malorum* (Berk.) Sacc.), which is prevalent in the eastern United States on apple and many other hosts.

The stromatic characters and pycnidial structure are very similar in the two fungi, but these features have been found to vary so greatly with the substratum that no importance can be attached to them for diagnostic purposes. The only constant difference between Berkeley's and Peck's species so far detected by the writer lies in the spore characters. The hyaline, non-septate (gradually turning light brown and becoming septate) pycnospores of *S. malorum* Berk. measure 9 to 13 by 22 to 33 μ, mostly 9·5 to 10 by 23 to 29 μ, and have a relatively thick, glassy wall similar to that observed in *Diplodia natalensis* [cf. *R.A.M.*, xii, p. 790]. The pycnospores of Peck's species, on the other hand, are somewhat irregular in shape, uniformly tan to brown, indiscriminately septate or non-septate, and measure 12 to 18 by 24 to 30 μ, mostly 12 to 13 by 25 to 27 μ. In view of the apparent constancy of these differences in spore characters, the writer is inclined to regard the two fungi under observation as at least specifically distinct.

To illustrate the omnivorous nature of the common eastern States apple black rot fungus (Peck's species) a list is given of 73 host genera on which it has been found, mostly in a quasi-saprophytic form. It has also been reported from southern Europe but not from the north-western United States. On the other hand, the apple fungus of the Pacific Coast (Berkeley's species) is very rare in the eastern United States but fairly common in western Europe.

The oldest names applied to Peck's species appear to be those

given by Schweinitz, only one of which, *Sphaeria obtusa* 1832, shows ascospores as detected by Cooke, who made the combination *Physalospora obtusa* in 1892. A comparison of Peck's species with Schweinitz's material convinced the writer that the former is identical with *P. obtusa* (Schw.) Cooke, by which name, therefore, the apple black rot fungus of the eastern United States should be known. A provisional list is given of 61 published and 5 unpublished synonyms of *P. obtusa*, of which 4, namely, *S. obtusa*, *Melanops quercum*, *P. cydoniae*, and *P. malorum* [ibid., iv, p. 636; v, p. 90; vi, p. 424] are based on the examination of type or authentic material of the perithecial as well as the pycnidial stages. The earliest known name for Berkeley's species (for which no perithecial stage is known) is *S. mutila* Fries 1823, transferred by Montagne in 1834 to the genus *Diplodia* as *D. mutila* (Fries) Mont. A comparative examination of Montagne's and Berkeley's material showed that *Sphaeropsis malorum* Berk. should be referred to *D. mutila* (Fries) Mont. A list of 13 published and 3 unpublished synonyms is given.

Salmon (E. S.) & Ware (W. M.). **The Plum rust on Apricot and Peach.**—*Gard. Chron.*, xciv, 2453, pp. 490–492, 3 figs., 1933.

The authors record, apparently for the first time in England, the occurrence of plum rust (*Puccinia pruni-spinosae*) [*R.A.M.*, xii, p. 751] on apricots in Sussex, Kent, and Devon, and on peaches and nectarines in the last-named county. It is believed that this form, which is probably a specialized one, may have been recently introduced from some other country. Notes on the characters and distribution of the fungus, which has long been well known on the plum in England, are given.

Kuprewicz (V. F.). Виды **Thecopsora** на Вишне и Черемухе. [Species of *Thecopsora* on the Cherry and Bird-Cherry.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Leningrad, Ser. II (*Plantae Cryptogamae*), *1933*, 1, pp. 405–409, 2 graphs, 1933. [German summary.]

Comparative studies of material collected from various regions of European Russia showed that the rust of cherry (*Prunus cerasus*) and of bird-cherry (*P. padus*) in these areas is caused by the same species of *Thecopsora*, which was identified as *T. padi* (= *T. areolata*) [*R.A.M.*, v, p. 197; xi, p. 340]. Teleutospores of this fungus do not appear to be produced on the cherry. In the Russian Far East, however, *P. cerasus* is attacked by another species, which was shown to be identical with *T. pseudo-cerasi* described by Hiratsuka from Japan [cf. ibid., vi, p. 756]. This differs from the former in the size of its uredospores, and it produces abundant teleutospores on the cherry.

Zeller (S. M.). **Crinkle disease of Strawberry.**—*Oregon Agric. Exper. Stat. Bull.* 319, 14 pp., 4 figs., 1933.

Crinkle disease of strawberries [*R.A.M.*, xiii, p. 110] in the Pacific coast region of the United States has caused the gradual

degeneration there of the Marshall variety and is a serious factor in the propagation of Corvallis and Ettersburg 121. In addition to the varieties previously cited [ibid., xi, p. 792], Clarks Seedling is also affected, as are the wild field strawberry (*Fragaria cuneifolia*) and the beach strawberry (*F. chiloensis*), transmission from both of which to cultivated strawberries was effected. Crinkle, which reduces the yield by over 50 per cent., is a mosaic-like, systemic virus disease, characterized at first by yellowish, pin-point spots in the leaves, the latter then becoming crinkled and unevenly streaked and spotted with yellowish tissues. Clearing of the veins sometimes accompanies this stage and the crinkling is due to a resulting check to the growth of the vein tissue. The plants are less erect than normally, somewhat chlorotic, and stunted. In some varieties such as Ettersburg 121 and Clarks Seedling the symptoms are less pronounced, rarely more than leaf mottling. It spreads from the mother plant to the runners, which perpetuate it in the planting stock. During the first few months after planting the symptoms are usually masked.

Crinkle is readily transmitted and disseminated by the strawberry leaf aphis (*Myzus fragaefolii*), the primary symptoms appearing some 12 to 15 days after inoculation. Seed taken from crinkle plants gave over 150 healthy seedlings and no diseased ones.

The condition is most conveniently eliminated from planting stock through the selection of healthy plants in plantings a year or more old, runners from these being planted in an isolated propagation plot according to a plant-unit system.

Crinkle is considered to be allied to but probably distinct from the yellows (xanthosis) described by Plakidas in California [ibid., vii, p. 650] and the yellow edge of strawberries in England [ibid., xii, p. 519].

Branas (J.) & Dulac (J.). **Sur le mode d'action des bouillies cupriques. Rôle de la dessiccation.** [On the manner of action of cupric mixtures. The part played by desiccation.]—*Prog. Agric. et Vitic.*, c, 53, pp. 642–644, 1933.

When acid, neutral, and alkaline Bordeaux and Burgundy mixtures were left to evaporate outdoors in full sunshine in July and in sunshine and shade in October (desiccation requiring, respectively, 2 hours, 1 day, and 4 days) and a week later distilled water was poured on to the residues and the amount of copper that dissolved was determined, it was ascertained that some of the copper sulphate in the acid Burgundy mixture had remained unprecipitated. In the neutral Burgundy mixture the copper sulphate kept in solution by the carbon dioxide tended to become progressively less dissolved the more carbon dioxide was liberated. The solubility of the copper carbonate of soda in the alkaline Burgundy mixture was considerably reduced by rapid desiccation. In acid, neutral, and alkaline Bordeaux mixture the precipitation of the copper dissolved in the original liquid stage continued at the expense of the calcium carbonate. With rapid desiccation the excess lime in very alkaline Bordeaux mixture did not become completely carbonated, so that the mixture retained an alkalinity favourable to the maintenance of the solubility of the copper.

Van Poeteren (N.). **Californische pap.** [Californian mixture.]—*Tijdschr. over Plantenziekten*, xxxix, 12, pp. 321–325, 1933.

In connexion with some general observations on the composition and application of lime-sulphur sprays against fruit diseases, the writer draws attention to the recent introduction into Holland of foreign brands with a higher specific gravity than was hitherto customary, involving much confusion with regard to the concentration of the fungicide in practical use. Dutch manufacturers are now beginning to put similar products on the market, and an examination of four samples with specific gravities of 29·7°, 31°, 30·2°, and 29·9° Beaumé, respectively, showed that a figure round about 30° may satisfactorily and economically be adopted as a standard of preparation.

Martin (H.). **Petroleum products as spray spreaders.**—*Journ. Soc. Chem. Ind.*, lii, 49, pp. 429T–432 T, 1933.

At the South Eastern Agricultural College, Wye, the writer investigated the adaptability of various petroleum products for incorporation as spreaders with insecticidal and fungicidal sprays. The products examined fall into the following groups. (1) Calcium γ-sulphonates isolated from the acid tar produced in the refinement of lubricating oils by neutralization with lime, filtration, and evaporation to dryness. In a crude form these sulphonates possess excellent spreading properties unaffected by mineral acids or by any spray material (e.g., lime-sulphur and Bordeaux mixture) in common use.

(2) Sodium β-sulphonates extracted from petroleum oils after acid refinement. The products investigated are known commercially as 'naphthenic sulpho-acids', 'sodium sulphonate A', 'soda acids', 'soda soaps', and 'sunoco' [*R.A.M.*, vii, p. 453]. This group is also characterized by eminently satisfactory spreading properties which are destroyed, however, by the addition of excess lime and copper sulphate, so that their range of utility is limited. The relative solubility of the sulphonic acids in water and of the alkali sulphonates in hydrocarbon oils suggests the superiority of this group over fatty acid or resin soaps in the preparation of miscible oils.

(3) The alkali naphthenates, derived from the alkali washings of crude petroleum oils, are good spreaders but, like the last mentioned, ineffective in the presence of excess lime or copper sulphate. The crude naphthenic acids, by reason of the phytocidal properties of the crude oil present, are unsuitable for the preparation of spray spreaders.

(4) Of the 'oxidized' petroleum derivatives, 'penetrol' has been recommended in the United States as an activator for nicotine [ibid., x, p. 225]. The active constituents of this preparation are alleged to be 90 per cent. oxidized petroleum hydrocarbons (32° to 40° B.) sulphonated. The other two products of this group, 'activol' and 'special spreader', resemble penetrol in character but are of British origin. All gave promising results, their spreading capacities being unimpaired by contact with copper sulphate or lime.

(5) The British pharmaceutical preparation 'ichthammol' consists of the ammonium salts of the sulphonic acids of an oily

substance, derived from a bituminous schist, together with ammonium sulphate and water. It is a blackish syrup yielding a solution in water of moderate spreading capacity, unaffected by calcium or copper compounds.

Symposium and discussion on the measurement of disease intensity.—*Trans. Brit. Mycol. Soc.*, xviii, 2, pp. 174–186, 1 graph, 1933.

A summary is given of three papers that were read at a meeting in London in January, 1933, of phytopathologists of the British Mycological Society, in which methods were described for the measurement in the field of the intensity of potato blight [*Phytophthora infestans*] by A. Beaumont, of apple scab [*Venturia inaequalis*] by R. W. Marsh, and of net blotch (*Helminthosporium teres*) of barley by H. B. Bescoby. In a discussion which followed, W. B. Brierley pointed out that the phrase 'measurement of disease intensity' is rather ambiguous, as in the sense it is usually used, it comprises really two distinct conceptions, namely, 'extensity' which is largely a matter of distribution and rate of increase of the disease, and 'intensity' which is largely a measure of lethality or damage done to that portion or product for which the given crop is cultivated.

Stevens (N. E.). **Some significant estimates of losses from plant diseases in the United States.**—*Phytopath.*, xxiii, 12, pp. 975–984, 6 graphs, 3 maps, 1933.

Most of the data summarized and discussed by the author in connexion with the estimation of losses from plant diseases in the United States have already been noticed in this *Review* from other sources [cf. *R.A.M.*, xiii, p. 176]. The diseases included in the present survey are wheat bunt [*Tilletia caries* and *T. foetens*: ibid., xi, p. 232], brown rot of peaches [*Sclerotinia americana*: ibid., xii, p. 378], sweet potato storage rots [*Rhizopus* spp., *Ceratostomella fimbriata*, and other organisms: ibid., iv, p. 699; v, p. 628, *et passim*], decay in forest products, and false blossom of cranberry [ibid., xii, p. 706].

Bundesanstalt für Pflanzenschutz (Landw. bakt. Versuchsanstalt) Mitteilungen 167 (2. Auflage), 216, 217, 221–223, 229, 230, 233, 234, 236. [Federal Institute for Plant Protection (Experimental Institute of Agricultural Bacteriology) Leaflets 167 (2nd Edition), 216, 217, 221–223, 229, 230, 233, 234, 236.] —20 pp., Vienna, 1933.

The leaflets enumerated in the title, issued by the Austrian Federal Institute for Plant Protection, deal with seed-grain disinfection (F. Pichler), 'glassiness' of apples due to physiological disturbances (R. Fischer), fruit tree carbolineum (O. Watzl), downy mildew of the vine (*Peronospora*) [*Plasmopara viticola*] (F. Hengl), club root of cabbage and other crucifers (*Plasmodiophora brassicae*) and its control, trellis rust of pears (*Gymnosporangium sabinae*) [*R.A.M.*, xi, p. 799], dying-off of apricots associated with adverse environmental conditions [cf. ibid., xii, p. 575], leaf spot of beet (*Cercospora beticola*) [ibid., xi, p. 19], bitter pit of apples [ibid., xiii, p. 169],

American gooseberry mildew (*Sphaerotheca mors-uvae*), and leaf curl of peaches (*Taphrina deformans*), all by R. Fischer.

PETERSEN (H. E.). **Wasting disease of Eelgrass (Zostera marina).** —*Nature*, cxxxii, 3348, p. 1004, 1933.

In a report by H. F. Lewis of the Department of the Interior, Canada, Miss E. S. Dowding is said to have detected 'a coarse mycelium' in one blackened portion of the rhizome cortex of one sample only of *Zostera marina* [*R.A.M.*, xiii, p. 115]. A branched, septate, dark brown mycelium is stated to be a constant feature of the black spots on eelgrass suffering from the wasting disease now widespread in Danish waters that the writer has examined. In the rhizomes the fungus mostly occupies the outer cortex; in the leaves it is found in the mesophyll cells. The organism (a Hyphomycete) was successfully isolated once only and found to be capable, when growing on agar blocks in sea water, of attacking *Zostera* leaves and producing dark spots. Conidia are produced in large numbers in sea water by the isolated mycelium, but only a few were observed in nature during the summer of 1933.

BUCHWALD (N. F.). **Om virussygdomme hos planterne.** [On the virus diseases of plants.]—*Naturens Verden, 1933*, pp. 447–470, 14 figs., 1933.

The history of research on the virus diseases of plants is concisely outlined and the various aspects of the problem now undergoing investigation are discussed. Notices of most of the recent work referred to have appeared from time to time in this *Review* [cf. *R.A.M.*, xiii, p. 116].

SORIANO (S.). **Nota sobre algunas enfermedades de los vegetales producidas por 'virus' en la República Argentina.** [A note on some plant diseases caused by 'viruses' in the Argentine Republic.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 38, pp. 87–90, 3 pl., 1932.

In addition to tobacco [*R.A.M.*, xi, p. 269], other well-known crops, and some weeds, the following plants are affected by viruses of the mosaic type in the Argentine Republic: *Isatis tinctoria*, lupins (*Lupinus albus* and *L. pilosus*), groundnuts, *Abutilon striatum* var. *thompsoni* [ibid., xi, p. 406], chilli (*Capsicum annuum*) [ibid., xii, pp. 354, 759], sunflower (*Helianthus annuus*), and *Pacourina edulis*. The writer found that lupins, on which observations have been carried out at the Buenos Aires Agricultural Experiment Station and in the surrounding country, are of first-rate importance in studies of interspecific transmissibility of mosaic and the insect vectors of infection.

ROEMER (T.). **Immunitätszüchtung. Eine zusammenfassende Darstellung 14jähriger Arbeiten aus dem Gebiete der Biologie (1920–1933).** [Breeding for immunity. A comprehensive survey of 14 years' studies in the biological field (1920–1933).]—*Flora*, N.F., xxviii (Karsten-Festschr.), pp. 145–196, 8 figs., 1 diag., 1933.

After an introduction explaining the economic and cultural

importance of plant breeding for freedom from fungous diseases, a very full account is given of the work carried out at the Halle Agricultural Institute for the past fourteen years in the breeding of wheat for resistance to smuts (*Tilletia tritici* [*T. caries*: *R.A.M.*, x, p. 717] and *Ustilago tritici* [ibid., ix, p. 708]) and rusts (*Puccinia glumarum* and *P. triticina*) [ibid., xi, p. 31]; barley to *U. nuda* [ibid., xi, p. 776] and *Helminthosporium gramineum* [ibid., x, p. 231]; oats to *U. avenae* [ibid., x, p. 652]; and beans (*Phaseolus vulgaris nanus*) to *Colletotrichum lindemuthianum* [ibid., xi, p. 666].

The methods employed are described at some length and a summary is given of the more important results. In all cases immunity was found to be transmitted by independent Mendelian factors. It was frequently possible to obtain exact data for the mode of inheritance (dominant or recessive) of immunity and susceptibility, while in a few cases, where only one genetic factor was involved, a complete analysis of the reactions could be made. In other instances, however, even an approximate calculation was precluded by the existence of two or more genetic factors, as indicated by the segregation ratios in the F_2 or F_3 generations. The resistance of wheat to *T. caries* was found to be recessive polymerous, to *U. tritici* and *P. glumarum* (summer wheat) recessive monomerous, to *P. glumarum* (winter wheat) dominant mono- and polymerous, and to *P. triticina* dominant monomerous; of barley to *U. nuda* dominant monomerous and to *H. gramineum* dominant polymerous; of oats to *U. avenae* dominant mono-, di-, and trimerous, and of beans to *C. lindemuthianum* dominant trimerous.

An important outcome of the Halle breeding experiments was the detection of biologic races within the species of some of the fungi concerned in the above-mentioned diseases, most of the work on which has been noticed in this *Review*.

ARNAUDI (C.). **Ueber die Technik der künstlichen Immunisierung von Pflanzen.** [On the technique of the artificial immunization of plants.]—*Phytopath. Zeitschr.*, vi, 5, pp. 525–530, 1933.

A summary is given of the various methods employed by the writer and others for the immunization of plants against parasitic diseases. Most of the work referred to has already been noticed in this *Review* [cf. *R.A.M.*, xi, pp. 529, 798; xii, p. 779; and above, p. 276].

BUCHWALD (N. F.). **De nyeste forskningsresultater vedrørende den kønnede forplantning hos rustsvampene.** [The results of the latest researches on sexual reproduction in the rusts.]—*Nordisk Jordbrugsforskning, 1933*, 2, pp. 131–148, 6 figs., 1933.

Following a brief historical sketch of the history of sex investigation in the rusts, beginning with Meyen's work in 1841, the writer summarizes and discusses some of the more outstanding results of recent studies of the problem, notices of which have appeared from time to time in this *Review* [cf. *R.A.M.*, xii, p. 530].

ANDRUS (C. F.). **Sex and accessory cell fusions in the Uredineae.** —*Journ. Washington Acad. Sci.*, xxiii, 12, pp. 544–557, 3 figs., 1933.

Continuing his studies on the mechanism of sex in the bean [*Phaseolus vulgaris*] and cowpea rusts (*Uromyces appendiculatus* and *U. vignae*, respectively) [*R.A.M.*, x, p. 810], the writer describes in detail the fusion of the spermatia with superficial hyphae of the gametophyte and the passage of the spermatial nucleus down the multicellular trichogynous hyphae which remain haploid after the spermatium nucleus has passed through their cells. Fertilization is effected by the entry of the spermatial nucleus into certain 'egg cells' at the base of the aecidium. The fertilization process apparently does not cease with the entrance of a particular spermatium nucleus into a given egg cell, since this is followed by division of the egg nucleus and probably also of the spermatium nucleus, and by further migrations of both.

GALLOWAY (L. D.). **The stimulation by dilute antiseptics of 'sectoring' in mould colonies.**—*Trans. Brit. Mycol. Soc.*, xviii, 2, pp. 161–162, 1 fig., 1933.

The author states that the majority of his cultures of *Aspergillus terreus* [*R.A.M.*, xi, p. 241] on flour agar were stimulated by the presence of 0·003 to 0·005 per cent. of the sodium salt of salicylanilide in the medium to produce sectors of a lighter colour than normal, and that after four subcultures on wort agar slopes the white and normal types still remained quite distinctive.

KÖHLER (E.). **Die Viruskrankheiten der Kartoffel.** [The virus diseases of the Potato.]—*Biol. Reichsanst. für Land- und Forstwirtsch. Flugbl.* 42, 4 pp., 5 figs., 1933.

Notes are given in popular terms on the occurrence, etiology, and control of leaf roll, mosaic, leaf curl, and streak of potatoes in relation to degeneration in Germany [*R.A.M.*, xii, p. 587; xiii, p. 119].

BÖHME (R. W.). **Vergleichende Untersuchungen mit Stämmen des 'X'- und 'Y'-Virus.** [Comparative studies on strains of the 'X' and 'Y' viruses.]—*Phytopath. Zeitschr.*, vi, 5, pp. 517–534, 1933.

Four X viruses are differentiated on the basis of the writer's observations on potatoes in Germany, viz., those originating in the Duke of York, Kuckuck, Gustav Adolf, and Erdgold varieties, the three first-named being of the 'mottle' or 'healthy' potato type [*R.A.M.*, xii, pp. 48, 581, 717, *et passim*], and the last partaking of the nature of 'etch' [ibid., xiii, p. 119]. Three distinct forms of the Y virus were further differentiated on the basis of their effects on various hosts, of which *Nicotiana sylvestris* and *Solanum aculeatissimum* showed the most characteristic symptoms. Natural and artificial mixtures of the two viruses, as well as X and Y in the pure state, were transmitted to a number of plants, including eight commercial tobacco, three chilli (*Capsicum annuum*), and two tomato varieties. The inoculated plants differed in the time of

onset and extent of the necrosis according to the identity of the infective agents. For instance, tomato and certain chilli varieties in particular failed to react to inoculation with the X-1 virus (Duke of York) by the development of streak, whereas the Gustav Adolf and Erdgold viruses (X-2 and X-4) caused severe necroses of the stems, petioles, and leaf pinnae with eventual defoliation, and the Kuckuck virus (X-3) produced similar but less pronounced effects. It was shown by inoculations with mixtures of the X and Y viruses that modifications in the symptoms or course of the resultant diseases may depend on variations in the virulence of the Y component. Apart from *N. glauca* and *N. palmeri* the species of *Nicotiana* used in the tests reacted in a very clear-cut manner to inoculation with the viruses. Eggplants are apparently immune from the strains used in these experiments, while *Nicandra physaloides* is resistant to some but susceptible to others. Within the species *Petunia violacea* and *P. nyctaginiflora* individual variations in reaction to the different X strains were observed. *Datura stramonium*, *D. inermis*, and *D. tatula* acted as 'filters' for all the Y strains tested, whereas *D. meteloides* reacted to inoculation with an X and Y mixture by symptoms recalling those of spot necrosis of tobacco.

Grafted on to President potatoes, all the X strains cause acronecrosis [ibid., xiii, p. 179] but X-1 and X-2, in contrast to X-4, are not transmissible by rubbing to Ackersegen, President, or Preussen. Deodara and Parnassia, on the other hand, contracted infection on inoculation with the X strains but showed no external symptoms. Full details are given of the manifestations induced in the various hosts by inoculation with the different X and Y strains. No differences were detected between the four X strains in respect of thermostability. On the other hand, strain 1 of the Y virus did not succumb to a temperature of 55° C. in the presence of an X strain, whereas strain 2 in the pure state failed to act on the test plants under these conditions.

FERNOW (K. H.). **A partially masked mosaic of Potatoes.**—*Amer. Potato Journ.*, x, 12, pp. 235–245, 1933.

The results [which are tabulated and discussed] of greenhouse indexing experiments on certified lots, or their progeny, of Smooth and Russet Rural potatoes from New York State indicated that at least a third and probably more of the tubers of these varieties are affected by a disease of the mosaic type not ordinarily detectable in field inspections [see preceding abstract]. Observations made on samples of New York potatoes planted in Bermuda in 1931–2 showed, however, that mosaic may be detected in both varieties in that island, the Smooth being apparently more susceptible than the Russets (average percentages of infection in 1931 18 and 8, and 1932 39 and 11, respectively).

Inoculation experiments by needle pricks, rubbing, and grafting showed that this masked form of mosaic is transmissible to Green Mountains and Bliss Triumphs, on which it produces marked but variable symptoms suggesting the participation of several viruses. The progeny of the inoculated plants were separated into

four distinct symptom groups as follows: (1) wrinkling but no curling and little distortion or streaking of the foliage; a few rather large, sharply outlined, pale areas on a leaf; (2) ruffling, curling, slight streaking, and distinct pale areas on the leaves; (3) wrinkling and curling more prominent than in the foregoing, pale areas less distinct, streaking; (4) marked curling and yellowing of the leaves, followed by defoliation, severe streaking of leaf veins, petioles, and stems, small, numerous, ill-defined pale areas.

The results of three years' observations on the effect of the disease on Rurals showed that a serious reduction in yield occurs even under conditions completely masking the symptoms. Such losses amount roughly to 30 bushels per acre, or 15 per cent. of the yield, and their prevention, chiefly by the use of carefully selected 'seed', is urged.

Barton-Wright (E.) & McBain (A.). **Studies in the physiology of the virus diseases of the Potato. II. A comparison of the carbohydrate metabolism of normal with that of crinkle Potatoes; together with some observations on carbohydrate metabolism in a 'carrier' variety. III. A comparison of the nitrogen metabolism of normal with that of leaf-roll Potatoes.**—*Ann. of Appl. Biol.*, xx, 4, pp. 525–548; 549–589, 29 graphs, 1933.

Continuing their studies of the physiology of the virus diseases of the potato [*R.A.M.*, xii, p. 48], the authors state that the results of their controlled experiments, in which they compared the carbohydrate metabolism in virus-free Arran Victory and President plants and in those that were infected by grafting with crinkle (Arran Victory from Irish Chieftain) and paracrinkle (President from King Edward), showed that in the early stages of the disease there was no statistically significant difference between the formation of carbohydrates in the healthy and in the diseased plants, sucrose being found to be the translocatory sugar in both cases. Significant differences, however, were determined in the later part of the season, sucrose showing a marked tendency to accumulate in the diseased leaf blades, and being formed in them for the most part by direct hydrolysis of starch, whereas in the healthy laminae it was formed by synthesis from hexose derived by hydrolysis from starch; there also was evidence that the translocation of sucrose was not so easily effected down the diseased as down the healthy petioles. The presence of a latent virus in a potato variety was shown to produce no significant difference in carbohydrate formation, either at the beginning or at the end of the growing season.

Further experiments indicated that there is apparently no fundamental difference in the nitrogen metabolism of healthy and leaf-roll infected plants of the same two varieties as above, and that the formation of nitrogenous compounds proceeds along the same lines in the healthy and diseased plants. Evidence is adduced in favour of the views of Abderhalden regarding the synthesis of protein in the green plant and a theory is advanced to account for protein synthesis direct from nitrate nitrogen and not through an intermediary stage of amino-acids.

Köck (G.) & Greisenegger (K.). **Tätigkeitsbericht des Kartoffelfachausschusses über das Jahr 1933.** [Report on the work of the Committee of Potato Experts during the year 1933.]—*Neuheiten auf dem Geb. des Pflanzensch.*, xxvi, 6, pp. 121–126, 1933.

An account is given of the work performed in Austria by the State-subsidized Committee of Potato Experts during 1933, among the activities of which the following may be mentioned. Further experiments on wart [*Synchytrium endobioticum*] control, near Frohnleiten, Styria, by soil disinfection with ventilato sulphur, sodium bisulphite, and sodium thiosulphate [*R.A.M.*, v, p. 249; ix, p. 334; xii, p. 187] gave very encouraging results in respect of the first-named treatment, the others being only partially effective. Considerable attention was paid to breeding for immunity from wart disease, over 100 hybrids having been inoculated for testing purposes during the year. Of 41 varieties and strains tested for their reaction to *S. endobioticum*, 25 proved to be susceptible.

The increased yields resulting from the use of 1, 0·5, and 0·25 per cent. Bordeaux mixture against *Phytophthora infestans* [loc. cit.] ranged from 26 to 29 per cent. for the higher and from 8 to 13 per cent. for the lower concentrations. It is considered to be unnecessary to exceed a strength of 1 per cent.

Folsom (D.). **Botrytis cinerea as a cause of Potato tuber rot.**—*Phytopath.*, xxiii, 12, pp. 993–999, 2 figs., 1933.

In 1932 stored Green Mountain potato tubers in north-eastern Maine were found to be infected by *Botrytis cinerea*, which caused a rather soft, dark rot of the tissues accompanied by a flabbiness and wrinkling of the skin. Where the tissues were penetrated by the fungus, the eyes were filled with tufts of grey mould, sometimes in association with blue mould (*Penicillium* sp.). Inoculation experiments with *B. cinerea* from decayed material produced the typical symptoms of the storage rot, as well as a more shallow, arrested type of lesion with a predominantly pinkish-buff surface. The deeper, more actively penetrating rot was found to be favoured by low temperature (5° C.) and a saturated atmosphere. No consistent differences in infective capacity were observed between cultures originating from tubers in 1927 and 1932, from leaves and stems in 1931, or monospore and monohyphal subcultures. Mycelial cultures were more virulent than spores, and tuber infection by *B. cinerea* is believed to be a sequel to stem and leaf blight, the internal mycelium passing from the stems to the tubers through the stolons.

Tullis (E. C.). **Leptosphaeria salvinii, the ascigerous stage of Helminthosporium sigmoideum and Sclerotium oryzae.**—*Journ. Agric. Res.*, xlvii, 9, pp. 675–687, 6 figs., 1933.

This is a full report of the author's studies, in which he established the genetic connexion between the sclerotial (*Sclerotium oryzae*), conidial (*Helminthosporium sigmoideum*), and ascigerous stages of the rice parasite *Leptosphaeria salvinii* Catt. [*R.A.M.*, xii, p. 392], a technical description of which is appended. The perithecia are dark, globose, 202 to 481 μ, with a rather short beak.

The asci are narrowly clavate, short-stalked, and 90 to 128 by 12 to 14 μ in diameter. The ascospores are biseriate, normally eight (rarely four), 3-septate, usually somewhat constricted at the septa, brown, the two terminal cells usually of a lighter colour, fusiform, somewhat curved, and 38 to 53 by 7 to 8 μ. The ascigerous stage has been found on seven commercial varieties in Arkansas, Louisiana, and Texas, on a rice selection in Arkansas and Louisiana, and was described by Cattaneo on commercial rice in Italy. Viable ascospores have been found on old rice stubble as late in the winter as January, but it was not determined whether they live through the winter to cause fresh infections in the spring. The sclerotial and conidial stages also occur on *Zizaniopsis miliacea*, and were produced in cultures from rice obtained from Japan and India.

NISIKADO (Y.), MATSUMOTO (H.), & YAMAUTI (K.). **Zur Kenntnis der physiologischen Differenzierung der Fusariumarten. II. Entwicklung verschiedener Stämme des Bakanaepilzes und Temperatur.** [Contribution to the knowledge of the physiological differentiation of *Fusarium* species. II. The development of various strains of the 'bakanae' fungus and temperature.]—*Landw. Studien*, xx, pp. 346–375, 1933. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 4, p. (110), 1933.]

The optimum temperature for mycelial growth in various strains of the 'bakanae' fungus [of rice, *Gibberella fujikuroi*: *R.A.M.*, xiii, p. 263] was found to be 27° C., while that for *Fusarium moniliforme* [*G. moniliformis*] and its var. *majus* [ibid., xii, p. 719 and above, p. 300] is somewhat higher (29°). One strain of *G. fujikuroi* even proved to be capable of profuse development at 35°, but for the majority the maximum lies between 31° and 36° and the minimum at 7° to 8°. The outline of the colonies is circular, generally very sharply defined at higher temperatures and blurred at low ones. Many strains of the 'bakanae' fungus produce a red or purple coloration of cooked rice, while one (possibly belonging to a different species) turns it yellow.

SHIMADA (S.). **Change of pathogenicity shown by the 'bakanae' fungus, Gibberella fujikuroi.**—*Trans. Sapporo Nat. Hist. Soc.*, xiii, pp. 6–8, 1933. (Japanese summary.) [Abs. in *Japanese Journ. of Botany*, vi, 4, p. (113), 1933.]

After protracted cultivation in artificial media, *Gibberella fujikuroi*, the agent of 'bakanae' disease of rice [see preceding abstract] was found to have lost the capacity of inducing overelongation in the host plant, the accelerative substances responsible for which were absent from the filtrates of the nutrient solutions.

SJOLLEMA (B.). **Kupfermangel als Ursache von Krankheiten bei Pflanzen und Tieren.** [Copper deficiency as a cause of diseases in plants and animals.]—*Biochem. Zeitschr.*, cclxvii, 1–3, pp. 151–156, 1933.

Attention is drawn to the simultaneous occurrence, in the marshy regions of Holland, Germany, and elsewhere, of the so-called 'licking' of stock and 'reclamation disease' of plants. The writer's

investigations in Holland showed that the hay used as fodder for the affected animals was noticeably deficient in copper, and in general the symptoms were alleviated by the administration of copper sulphate.

In connexion with the reclamation disease of cereals it was ascertained that the copper content of winter wheat (whole ears) on sick soils was only 1·5 mg. per kg., compared with 3 and 4·5 mg., respectively, in plants treated with 60 or 120 kg. copper sulphate per hect. Rye seed in sick soil contained barely a trace of copper, while that in another part of the same field manured with compost had a copper content of 2 mg. per kg. Diseased oat straw contained 4 mg. copper per kg., while double the quantity was found in plants from the copper sulphate-treated portion of the field. These data indicate that the copper sulphate treatment raises the low copper content of the plants [*R.A.M.*, xiii, p. 57]. Smith in his investigations on the etiology of reclamation disease [ibid., vii, p. 269] failed to detect any copper in compost and concluded that the condition, which is readily combated by applications of copper sulphate (50 to 80 kg. per hect.) [ibid., vii, p. 396; x, p. 704], did not arise from copper deficiency. In three samples of compost analysed by the writer and his collaborators, however, 200 to 500 mg. copper per. kg. was found, and it is estimated that the application of compost at the normal rates of 50,000 to 80,000 kg. per hect. introduces as much copper into the soil as 60 to 130 kg. copper sulphate. The iron content of the compost was also exceptionally high.

Bell (A. F.). **Division of Pathology.**—*Thirty-third Ann. Rept. Queensland Bureau of Sugar Exper. Stat.*, pp. 54–61, 1933.

During the period under review varietal resistance trials in Queensland showed that the higher-numbered P.O.J. sugar-canes of the Kassoer blood line are generally highly susceptible to red stripe [*Phytomonas rubrilineans*: *R.A.M.*, xii, p. 245], downy mildew [*Sclerospora sacchari*], and Fiji disease, so much so that they introduce an entirely new degree of susceptibility, but that they are very resistant to gumming disease [*Bacterium vascularum*] and mosaic [ibid., xii, p. 787].

The variety chiefly affected by chlorotic streak [see next abstract] is Badila. A rapid survey indicated that prevalence is greatest in the rainiest parts of north Queensland, especially in low-lying areas. Attempts to transmit the disease by knife infection failed. As secondary transmission in the field is not, apparently, rapid control through the use of healthy planting material will probably be effective.

Dwarf disease [ibid., xii, p. 245] was reported from eight more properties in the Homebush area, while a further cane variety, Malagache, has now been found to be susceptible. Attempts to transmit the disease by means of *Aleurodes berghi*, *Aphis sacchari*, and *Perkinsiella saccharicida* failed. Secondary spread appears to be restricted to a particular type of country.

Breeding tests for resistance to *Bact. vascularum* are in progress, but only one cross (P.O.J. 2940 × S.C. 12/4) has shown sufficient resistance to warrant further trial.

Evidence obtained with Badila canes (plant and ratoon) during a period of five years strongly suggested that the final loss of yield due to *P. rubrilineans* is practically negligible. In one district early planting resulted in a very marked degree of control, one field planted in August having 39 per cent. dead stalks while another in proximity to it, planted in April, had only 2·5 per cent. In a varietal resistance trial at the South Johnstone Experiment Station H.Q. 426, S.J.4D, Badila, P.O.J. 2940, and P.O.J. 2878 showed, respectively, 0, 0, 10, 20·7, and 21·5 per cent. dead stalks.

A root disease of the *Marasmius* type was observed in different parts of Queensland, particularly in the Bundaberg district. Dark red spots, which sometimes coalesced, appeared on the leaves and were equally visible on both sides; they were more common on older than on younger leaves, sometimes killing the leaf. Stalks bearing affected leaves almost always showed on dissection a dry, brownish-red rot at the base and considerable root rot; diseased and healthy shoots were frequently present in one and the same stool.

Bell (A. F.). **A new disease of Cane in North Queensland.**—*Queensland Agric. Journ.*, xl, 6, pp. 460–464, 3 figs., 1933.

When cuttings of Badila sugar-canes infected with pseudo-scald (now identified with the Javanese 'fourth disease' and Hawaiian chlorotic streak) [*R.A.M.*, ix, p. 271; xii, pp. 245, 554] were subjected to hot water treatment (20 minutes at 52° C.) the treated canes remained completely free from the disease (though 14 out of 16 untreated stools developed the symptoms of the condition), were much higher than the immediately adjacent untreated canes, averaged 5 stalks per stool as against 3 for the untreated canes, and also gave a noticeably larger yield.

In Badila the leaf symptoms consist of cream to white longitudinal streaks in the leaf blade, from $\frac{1}{16}$ to $\frac{3}{16}$ in. wide, running parallel to the veins, and sometimes extending the whole length of the leaf, but usually less than 1 ft. long, and often fragmented. In older streaks the tissue frequently dies and becomes ashy-grey, with a narrow, reddish border. Such dead areas are small at first but may subsequently extend along nearly the whole length of the streak. In contrast with the sharply defined, uniform streaks produced by true leaf scald [*Bacterium albilineans*], the streaks due to pseudo-scald are wavy and of varying width; pseudo-scald streaks do not pass down to the leaf sheath as do the streaks caused by true scald, which, moreover, are seldom fragmented. If the stalks of plants affected with pseudo-scald are cut open a very few reddened fibres may be found.

Pseudo-scald symptoms are most pronounced in Badila canes when the young crops are just beginning to form canes (October–November in Queensland). As the cane grows higher the leaf markings often disappear, with the result that by the following March it may be impossible to find a single streak in a field nearly 100 per cent. diseased.

The wide distribution of pseudo-scald indicates that it has long been present in Australia.

LEBEDEVA (Mme L. A.). Грибы и миксомицеты Советской Карелии [Fungi and Myxomycetes of Soviet Karelia.]—*Acta Inst. Bot. Acad. Scient. U.R.P.S.S.*, Leningrad, Ser. II (*Plantae Cryptogamae*), *1933*, 1, pp. 329–403, 1933. [German summary.]

This is a systematically arranged and annotated list of 447 species of Myxomycetes and fungi, parasites and saprophytes, which were collected during the scientific expedition in 1920 to 1922, inclusive, to Russian Karelia, [a district a little to the north of Leningrad]. Morphological details are given of the less common organisms, and one genus and five species are fully described as new to science, Latin diagnoses being appended.

KERN (F. D.), THURSTON (H. W.), & WHETZEL (H. H.). **Annotated index of the rusts of Colombia.**—*Mycologia*, xxv, 6, pp. 448–503, 1933.

Critical and taxonomic notes are given on 215 species of Colombian rusts, 102 of which belong to *Puccinia*, 32 to *Uromyces*, 37 to unattached forms of *Aecidium* and *Uredo*, and the remainder to miscellaneous genera. The list includes five new species [with Latin diagnoses] and two new combinations. A complete index of 331 hosts and a selected bibliography are appended.

KERN (F. D.). **The microcyclic species of Puccinia on Solanum.**—*Mycologia*, xxv, 6, pp. 435–441, 1 pl., 1933.

A further critical examination has been made of the nine microcyclic species of *Puccinia* occurring on *Solanum* in Colombia, of which only *P. pittieriana* is recorded on potato [*R.A.M.*, x, p. 340; xi, pp. 226, 672]. Notes are given on the geographical distribution, host range, and synonymy of the species.

WILTSHIRE (S. P.). **The foundation species of Alternaria and Macrosporium.**—*Trans. Brit. Mycol. Soc.*, xviii, 2, pp. 135–160, 3 pl., 6 figs., 1933.

This is a detailed and fully illustrated account of the author's re-examination of the foundation species of *Alternaria* and *Macrosporium* in an attempt to clear up the existing confusion in the taxonomy of these two genera. He traces the various conceptions of *A. tenuis* since Nees, who founded the genus on this single species in 1817, and concludes that the conception of this species now prevailing does not agree with that of Nees, although the characters of the genus have been correctly interpreted. He also traces the important points in the history of the genus *Macrosporium* from its foundation by Fries in 1832 on the four species *M. convallariae*, *M. tenuissimum*, *M. cheiranthi*, and *M. caricinum*. There does not exist any material which would permit of a definite identification of the first-named species, but what appears to be authentic material shows that the second is a recognizable species which the writer considers should be referred to *Alternaria* as *A. tenuissima* n. comb. The type of *M. cheiranthi* is available from Libert's exsiccatum, and this fungus was collected by the author on wallflowers (*Cheiranthus cheiri*) in England in 1930; it is regarded as a good and recognizable species, only the records on

this host agreeing with the type. The fourth species, *M. caricinum*, is a *Clasterosporium* identical with *C. caricinum* Schweinitz.

The study of various species referred to these two genera, *Alternaria* and *Macrosporium*, shows that they include three types of fungi, namely: (*a*) those forming long chains of shortly or comparatively shortly beaked spores, such as *A. citri*, *A. longipes*, *A. tenuis* auct., &c., all of which are clearly congeneric with *A. tenuis* Nees, and are placed in the genus *Alternaria* by common consent; (*b*) those forming chains only rarely, the spores being provided with long, filiform beaks, e.g., *A. macrospora*, *A. tomato*, *A. solani*, *M. ricini*, *M. sesami*, &c.; these are sometimes placed in *Alternaria* and sometimes in *Macrosporium*; and (*c*) those with spores normally borne singly (though occasionally bearing secondary ones on short conidiophores), sarcinaeform, without any beak, usually with a major cross-wall accompanied by a constriction, e.g., *M. sarcinula*, *M. parasiticum*, *M. eriobotryae*, and the like, all of this type being commonly referred to *Macrosporium*. This last forms a homogeneous group, sharply defined from the other two which grade into one another.

Of the five foundation species discussed above, only three need be considered, namely, *A. tenuis*, *M. tenuissimum*, and *M. cheiranthi*, and as these belong to groups (*a*) and (*b*), they can best be considered as representing a single genus. The author gives reasons for preferring the generic name *Alternaria*, *Macrosporium* being placed in the list of *nomina ambigua*. *A. tenuis* is considered to be the type of the genus, and *A. tenuissima* and *A. cheiranthi* the Friesian representatives. The name *Macrosporium* being already used, its type being an *Alternaria*, the forms in group (*c*) must find another name, *Thyrospora* [*R.A.M.*, v, p. 233] becoming the valid genus for these forms.

Marchionatto (J. B.). **Notas sobre algunos 'Sclerotium' parasitos de las plantas economicas.** [Notes on some species of *Sclerotium* parasitic on economic plants.]—*Physis* (*Rev. Soc. Argentina Cien. Nat.*), xi, 39, pp. 301–305, 4 figs., 1933.

Since 1929 *Sclerotium rolfsii* has been observed in the Argentine attacking carnations, dahlias, groundnuts [*R.A.M.*, xi, pp. 431, 621, 699], *Solidago microglossa*, and potato [ibid., xi, pp. 547, 748]. *Sclerotium cepivorum* has been recognized since 1913 on onions, garlic, and many other kitchen-garden plants [ibid., xi, p. 219]. A species of *Sclerotium* allied to *S. cepivorum* was isolated by J. C. Lindquist from chilli fruits, and another resembling *S.* [*Sclerotinia*] *sclerotiorum* from the roots of *Carthamus tinctorius*.

Leach (R.) & Smee (C.). **Gnarled stem canker of Tea caused by the Capsid bug (Helopeltis bergrothi Reut.).**—*Ann. of Appl. Biol.*, xx, 4, pp. 691–706, 2 pl., 1933.

This is an expanded account of the authors' investigation of the tea canker caused by the insect *Helopeltis bergrothi* in Nyasaland, a preliminary report of which has already been noticed [*R.A.M.*, xii, p. 332; xiii, p. 232].

JOCHEMS (S. C. J.). **Ziekten der Tabak.** [Tobacco diseases.]—*ex* **Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1933.** [Survey of the diseases and pests of Deli Tobacco in the year 1933.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. ii, lxxxviii, pp. 3–16, 1 map, 1933.

Stem scorch (*Pythium* spp.) was reported from 43 tobacco plantations in Sumatra [*R.A.M.*, xii, p. 471], mostly in a sporadic form but in some cases showing an incidence of up to 80 per cent. In six plantations it was observed that the disease was most prevalent in areas previously planted with *Leucaena glauca*, while in another a connexion was traced between the presence of *Phytolacca octandra* and the occurrence of *Pythium* in the tobacco.

Leaf scorch (*Cercospora nicotianae*) [ibid., xii, p. 333] occurred in some plantations in the field and in others in the curing barns; only one plantation reported a serious attack of both forms.

Notes are given on the intensity of various other tobacco diseases, including several of the virus type. Four of the five plantations affected by 'daon lidah' [ibid., xii, p. 471] are situated on alluvial soils while the fifth is on residuary liparite. As usual, the disease extended over several groups of fields, some of which were affected to the extent of 80 per cent. Ordinary mosaic ('peh sim') is more influenced by soil types than any of the others, being practically absent from residual soils and prevalent on alluvial ones. A map is given to bring out this relationship in the Medan district. Rotterdam B disease [loc. cit.] shows a somewhat similar distribution.

DUGGAR (B. M.) & JOHNSON (B.). **Stomatal infection with the virus of typical Tobacco mosaic.**—*Phytopath.*, xxiii, 12, pp. 934–948, 1 graph, 1933.

In order to test the possibility of the stomatal infection of tobacco leaves by the typical mosaic virus, natural infective juice was diluted to one-tenth in distilled water, then celite-treated [*R.A.M.*, xii, p. 648], and applied to the surfaces with a De Vilbiss No. 15 atomizer. Data on humidity and temperature were then taken, and strips of the epidermis removed from each of two control plants to ascertain the size of the stomatal apertures. The sprayings were made in a subdued light, and at varying intervals on batches of 10 plants throughout a continuous period of 24 hours.

The percentage of infection resulting from this method of inoculation was found to range from 30 to 90, with an average of 70, or considerably higher than was suggested by previous experiments (unpublished data) with full-strength infectious juice passed through a porous porcelain filter. No correlation could be established between the time of day or environmental conditions and the percentage of mosaic. Some indication was given of a connexion between the size of the stomatal apertures and the incidence of infection, but the evidence on this point is not entirely conclusive. No increase of infection (as compared with that induced by the spraying method) was secured by dropping a virus suspension on leaf areas in which the epidermal hairs had been severely damaged by rubbing. A lower percentage of infection, on the other hand, resulted from the placing of large drops of the suspension on

unwounded leaves. The very low incidence of mosaic following the immersion of individual healthy leaves attached to the plants for varying periods in virus suspensions is tentatively attributed to surface tension factors or possibly the stomata are blocked by air bubbles. Infection with the atomizer may be due either to the 'shooting' of particles of the virus suspension into fully open stomata, or more probably to the spreading films formed as the spray particles impinge on the stomatal walls.

Barton-Wright (E.) & McBain (A. M.). **Possible chemical nature of Tobacco mosaic virus.**—*Nature*, cxxxii, 3348, pp. 1003–1004, 1933.

Johnson's No. 1 tobacco mosaic [*R.A.M.*, xiii, pp. 188, 192], received from the Cheshunt Research Station, proved to be transferable by juice inoculation to *Nicotiana macrophylla*. An examination was made of the mixed phosphate eleuate described by Vinson and Petre [ibid., x, p. 761]. This was found to contain protein and to be highly infectious to all the ten plants inoculated. Protein was further detected in the heavy white precipitate resulting (contrary to Vinson's and Petre's observations) from the addition of acetone to the eleuate, which was also infectious to all the five plants inoculated. The acetone precipitate was found to be separable into two fractions, a white crystalline solid and a gelatinous substance that proved to be protein. Inoculation with the latter alone induced mosaic in all five inoculated plants. On purification, washing with ether, and desiccation, the white crystalline solid was found to consist mainly of phosphate with a considerable admixture of organic matter but no nitrogen; it also was infectious to all five plants inoculated in the first series of tests and to all eight used in the second. That the protein fraction is not necessary for mosaic infection was further shown by the following test. The addition of 1 per cent. safranin to the phosphate eleuate produced a slow precipitate, which was separated on the centrifuge, suspended in water, and the safranin removed with normal amyl alcohol. The aqueous solution, containing neither protein, phosphate, nor nitrogen, was shown to be infectious.

For control purposes, sap from healthy plants was treated as described above, but in this case the addition of acetone to the mixed phosphate eleuate merely resulted in a faint opalescence which did not settle for many hours.

The isolation of a white crystalline compound containing no nitrogen and yet highly infectious is considered by the writers to preclude the 'living entity' theory [ibid., xiii, p. 116] of the tobacco mosaic virus. In its precipitation with safranin it shows affinities with the proteolytic enzymes, but further investigations are necessary to determine its exact nature.

Jensen (J. H.). **Isolation of yellow-mosaic viruses from plants infected with Tobacco mosaic.**—*Phytopath.*, xxiii, 12, pp. 964–974, 2 figs., 1933.

Small, bright yellow spots, containing the yellow mosaic virus [*R.A.M.*, xi, pp. 735, 750], occasionally developed on Turkish tobacco, *Nicotiana sylvestris*, and tomato leaves infected with

ordinary tobacco mosaic, whether naturally or as a result of inoculation.

Three groups among 26 isolations made from these yellow spots produced markedly divergent symptoms on various species of *Nicotiana*, tomato, *Physalis angulata*, and Hangchow Long eggplants. The viruses of group (1) caused general systemic infection with symptoms resembling those of tobacco mosaic but characterized by more intense yellowing. Vein clearing was a consistent feature of this group and was succeeded by the emergence, first of several mottled, distorted leaves and then of three or four intensely green ones which gradually developed large chlorotic areas. In some cases the foliar tissue was so severely injured that complete collapse and necrosis ensued. The first symptoms of systemic infection by the group (2) viruses consist of numerous small, yellow lesions on one or two of the young leaves. In some cases the spots tended to coalesce and form a rough vein-clearing pattern, while in others they slowly expanded to cover most of the leaf. On the higher leaves blotches or ring-like lesions appeared and slowly enlarged. Group (3) was represented by a number of isolations producing few or no symptoms besides the primary yellow lesions on the inoculated leaf. Sometimes one or two leaves above the inoculated one showed isolated yellow spots, while others bore chlorotic oak-leaf patterns. The viruses of group (1) are readily transmissible to healthy plants, whereas those of (2) and (3) are only communicable with great difficulty. They reproduced their characteristic symptoms on further transmission.

The evidence obtained in the course of these studies indicates that the yellow mosaic viruses originate during the multiplication of the tobacco mosaic virus in infected plants. Since some are transmissible with difficulty it is improbable that they would be carried over as admixtures with the ordinary mosaic, and attempts to isolate the latter free from them failed.

Böhme (R. W.). **Einige Fälle spontaner Infektion mit echtem Tabak-Ringflecken-Virus (Tobacco-ringspot).** [Some cases of spontaneous infection with the true Tobacco ring spot virus (Tobacco ring spot).]—*Phytopath. Zeitschr.*, vi, 5, pp. 507–515, 9 figs., 1933.

Attention is drawn to the spontaneous development of a virus apparently identical with true ring spot [*R.A.M.*, xiii, p. 131] on isolated plants of pure lines of the Samsun and Baffra tobacco varieties from the Forchheim Tobacco Research Institute. In a comparative test with German and American plantings of Samsun, four out of 120 of the former showed symptoms indicative of ring spot, which did not appear in any of the 80 of the latter. A similar phenomenon was observed on the Turkish Xanthia and a Virginian tobacco. Mechanical transmission experiments with the expressed juice gave positive results on *Petunia violacea*, *Datura stramonium*, and Paul Krüger [President] potatoes (local symptoms only on the last-named), but failed on *Capsicum annuum* and tomatoes. On Ackersegen potatoes the ring spot virus appeared spontaneously in the field in the form of an aucuba mosaic-like yellowing and was successfully transmitted to *D. tatula*, *P. viola-*

cea, and *Nicandra physaloides*. It is pointed out that insect transmission of this disease has apparently not been recorded.

HOGGAN (ISMÉ A.). **Some factors involved in aphid transmission of the Cucumber-mosaic virus to Tobacco.**—*Journ. Agric. Res.*, xlvii, 9, pp. 689–704, 1 fig., 1933.

The results of experiments reported in detail in this paper showed that single individuals of the green peach aphid (*Myzus persicae*) were only occasionally able to transmit cucumber mosaic [*R.A.M.*, xii, p. 673] to tobacco, the percentage of infection increasing with the number of insects used. No differences were observed in the relative efficacy of the various stages of the aphid in transmitting the virus, and the adults were shown to become infective after feeding in the adult stage alone on the diseased host. The entire process of picking up the virus and transmitting it to a healthy tobacco plant required a very short time, usually under 30 minutes, there apparently being no incubation period of the virus inside the insects. Viruliferous aphids lost their infectivity after feeding for two hours on a healthy plant or after starvation for 18 to 27 hours, but were still infective after having been starved for two to three hours. There was no evidence that the virus is transmitted by infective aphid parents to their progeny.

The results of the investigation would indicate the purely mechanical nature of the transmission of the cucumber mosaic virus by *M. persicae*. It is believed that the selective action of this aphid in picking up the cucumber mosaic virus alone from a combination of this virus with that of true tobacco mosaic may be due to the failure on the part of the aphid to extract the tobacco mosaic virus from the diseased host tissues.

Transference of infective aphids from diseased to healthy plants by means of a camel's-hair brush gave much less reliable results than when the insects were transferred on pieces of diseased leaves and allowed to migrate naturally to the new host.

HILL (A. V.) & ANGELL (H. R.). **Downy mildew (blue mould) of Tobacco. I. The influence of over-wintered plants, II. Wild hosts, and III. Spraying.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 4, pp. 260–268, 1 map, 1 pl. [opp. p. 308], 1933.

After referring to the prevalence of blue mould of tobacco [*Peronospora tabacina*: see above, p. 276] in New South Wales and Victoria during the autumn of 1932, the authors state that mycelium was found to be present at that time in the leaves, stems, and roots. The aerial portions of the plants were killed by frosts during the following winter, but the dormant underground buds began to grow in the spring (September), and mycelium was found in the young shoots. In October other shoots on the same plants showed characteristic infection, and it was evident that *P. tabacina* had survived the winter in the mycelial condition, the disease on the new spring growth arising from internal not external sources [cf. ibid., xii, p. 209]. The production of conidia on overwintered plants in the field has been repeatedly observed by the authors during the past four years.

Nicotiana glauca and *N. suaveolens*, besides being poisonous to

animals, are also hosts of *P. tabacina*. Owing to its resistance to drought *N. glauca* was formerly used for hedges and ornamental purposes in Australian gardens, but it escaped from cultivation and is now found in many localities, though both it and *N. suaveolens* tend to be restricted to districts with an average rainfall of not over 25 in. At Deniliquin in the south of New South Wales and at Cobram in the Murray Valley *N. glauca* was severely attacked by *P. tabacina*, some of the young shoots being killed; conidia were found on the affected leaves, and tobacco seed-beds in the vicinity were seriously attacked. *N. glauca* being perennial, the mycelium persists from year to year in the stems, whence it grows into the leaves and produces conidia which can infect the tobacco seed-beds.

When the disease was epidemic in neighbouring seed-beds spraying tobacco seedlings with Bordeaux mixture (2–2–40) at five-day intervals did not prevent the occurrence and spread of blue mould, as it was found impracticable to reach all parts, especially the under surface of the lower leaves. The earliest attacks were in the beds nearest to diseased overwintered plants. Infection did not occur early in isolated seed-beds, nor was it destructive where the plants were grown under relatively dry conditions.

The use of clean seed and the eradication of diseased overwintering plants would materially assist in the production of healthy seedlings, and by delaying any attack that might materialize would reduce the risk of serious loss. Seed-bed sites should be well drained, sunny, and if possible on a slope.

MANDELSON (L. F.). **Additional recommendations for the control of blue mould of Tobacco.**—*Queensland Agric. Journ.*, xl, 6, pp. 465–469, 2 figs., 1933.

After briefly summarizing improved methods of field sanitation for the control of blue mould of tobacco [*Peronospora tabacina*: see preceding abstract] the author states that from the time when they show above ground the seedlings should be sprayed every four days (with additional applications when they are growing rapidly and after heavy storms) with home-made colloidal copper, using soft soap as a spreader, or with copper emulsion, details of the preparation and correct application of which are given.

MANDELSON (L. F.). **Fungicidal experiments for the control of blue mould of Tobacco.**—*Queensland Agric. Journ.*, xl, 6, pp. 470–494, 3 figs., 1933.

In this paper the author gives details of the experiments on which he bases his recommendations [see preceding abstract] for the control of blue mould of tobacco (*Peronospora tabacina*). The results of the tests made with numerous fungicides are tabulated, the degree of control obtained being noted in each case, with brief observations. Even under conditions so conducive to infection that the controls were destroyed, a copper emulsion containing 3·1 per cent. soft soap and 0·47 per cent. copper sulphate applied first 13 days after germination, then weekly for three weeks, and thereafter twice weekly gave such good control that the beds became overcrowded from the dense stand of seedlings.

Stevens (N. E.). **United States of America: further distribution of Tobacco downy mildew in 1932.**—*Internat. Bull. of Plant Protect.*, vii, 12, pp. 268–269, 1933.

During 1933 downy mildew of tobacco (*Peronospora hyoscyami*) was very prevalent in North and South Carolina and Georgia [*R.A.M.*, xii, p. 732], while its range was more extensive than in any previous year. Infection was again found as far north as Lancaster County, Pennsylvania, and was widely distributed in south-western Virginia and eastern Tennessee.

Van Beyma Thoe Kingma (F. H.). **Beschreibung einiger neuer Pilzarten aus dem Centraalbureau voor Schimmelcultures II.—Baarn (Holland.)** [Description of some new species of fungi from the Centraalbureau voor Schimmelcultures, Baarn (Holland) II.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 8–12, pp. 236–243, 6 figs., 1933.

Morphological and cultural details are given of five new species of fungi identified by the writer at the Centraalbureau voor Schimmelcultures [cf. *R.A.M.*, xii, p. 634]. *Cephalosporium tabacinum* n. sp. was received from Bristol and stated to have been isolated from the tissues of a diseased tobacco plant. It is characterized by a colourless growth of fasciculate, indistinctly septate, radiating hyphae, 1·3 to 2·7 μ broad, non-septate conidiophores of irregular shape, 16 to 36 by 2 to 3·3 μ, and hyaline, ellipsoidal to subglobular, biguttulate conidia, 4 to 8 by 2·7 to 3·7 μ (mostly 5·3 by 3·3 μ), uniting under moist conditions into heads 10 to 15 μ in diameter.

Holmes Smith (E.). **Spotted wilt disease of Tomatoes.**—*Gard. Chron.*, xciv, 2445, p. 350, 3 figs. (2 on p. 351), 1933.

An account is given of an outbreak of spotted wilt in a tomato house near Manchester [*R.A.M.*, xii, p. 541] in 1933, the characteristic metallic bronzing, chlorosis, and necrosis of the foliage having been noticed two to three weeks after the plants were brought into the house from another nursery. The fruit on affected plants, which were stunted, was marked by a yellow bull's-eye mottling, confined to the older ripening fruits on the trusses. Dahlia leaves in the same greenhouse, on which *Thrips tabaci* were particularly numerous, showed a series of pale halo spots surrounded by concentric dark brown rings [ibid., xiii, p. 133], while those of nasturtium (*Tropaeolum*) [*majus*] were mottled yellow with scattered dark brown, ringed spots or punctures, and antirrhinums were also affected, the chlorotic leaves showing a uniform circular spotting. Suggestions for the control of the vector, *T. tabaci*, by frequent applications of calcium cyanide, or dusting the foliage with grade 16 naphthalene at the rate of 10 oz. per 1,000 cu. ft. of glass are given.

Ninth Annual Report of the Imperial Forestry Institute, University of Oxford, 1932–33.—29 pp., 1933.

The following items of phytopathological interest occur in this report (pp. 14–16). Sweet chestnut [*Castanea sativa*] trees in Herefordshire were again attacked by *Phytophthora cambivora*,

the agent of ink disease [*R.A.M.*, xii, p. 334]. Inoculation experiments with the fungus on the reputedly resistant Japanese chestnut (*C. crenata*) [ibid., xiii, p. 63] gave positive results.

Studies on poplar canker have shown that an unexpectedly large number of species are liable to this disease, including *Populus generosa* and *P. eugenei* [ibid., xiii, p. 150].

The 'watermark' disease of cricket-bat willows [*Salix caerulea*, attributed by W. R. Day to *Bacterium salicis*: ibid., iv, p. 321; cf. also ibid., xiii, p. 66] is stated to be still causing heavy damage in parts of Essex, with the result that the County Council has ordered the compulsory felling of infected trees.

Birch seedlings have suffered severely of late years from defoliation caused by the leaf rust, *Melampsoridium betulinum* [ibid., viii, p. 344].

BERGENTHAL (W.). **Untersuchungen zur Biologie der wichtigsten deutschen Arten der Gattung Stereum.** [Investigations on the biology of the most important German species of the genus *Stereum*.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxix, 8–12, pp. 209–236, 26 figs., 1933.

The writer describes in detail the results of his investigations at the Münden (Hanover) Forestry College on the biology of the principal species of *Stereum* found in German forests and wood piles. Although under natural conditions the fungi under observation are marked by their preference either for hard- or soft-woods (e.g., *S. sanguinolentum* [*R.A.M.*, x, p. 572] was found only on conifers, *S. hirsutum* [ibid., xii, p. 664], *S. rugosum* [ibid., xii, p. 44], and several others on broad-leaved trees), in culture they grew and sporulated equally well on both. *S. gausapatum* [ibid., xi, p. 497], however, was exceptional in this respect, growing only on oak wood or in extracts therefrom, while all the others tested grew well in extracts from various kinds of wood. The presence of resin does not deter the hardwood-inhabiting species of *Stereum* from penetrating conifer wood. Oak heartwood showed a high degree of resistance to fungous infection, apparently not attributable to its richness in tannin which is dissolved by the species concerned. The growth of these organisms can evidently be checked by certain substances such as are peculiar, for instance, to oak heartwood when contrasted with that of the beech. The fungi studied can utilize any of the carbohydrates, including pure cellulose, which is, indeed, completely disintegrated notwithstanding the typically 'white' character of the rots [cf. ibid., xi, p. 343]. In damp situations *S. rugosum* forms large canker-like swellings on oaks, infection starting at a withered branch; *S. quercinum* Potter is considered by the author to be a synonym of this species.

GEORGEVITCH (P.). **Bolest Brestova u Slavonskim šumama.** [The Elm disease in Slavonic forests.]—*Inst. Recherch. Forest. Belgrade, 1933*, pp. 1–32, 2 pl., 1 fig., 1933. [German abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvi, 6, p. 127, 1933.]

From the wood of elms in the forests of Jugo-Slavia, where a rapidly progressive die-back has been in evidence since 1925, the writer isolated a new rod-shaped bacterium, *Bacillus ulmi*, which

is considered to be the agent of the disease [cf. *R.A.M.*, viii, p. 343]. *Graphium* [*Ceratostomella*] *ulmi* never developed in bouillon cultures from infected wood, so that the die-back in Jugo-Slavia is apparently quite distinct from that occurring in other parts of Europe [ibid., xii, p. 734 *et passim*].

Boudru (M.). **Quelques notes sur la biologie du Ceratostomella ulmi (Schwarz) Buisman, agent de la thyllose parasitaire de l'Orme.** [Notes on the biology of *Ceratostomella ulmi* (Schwarz) Buisman, the agent of parasitic tylosis of the Elm.] *Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, ii, 4, pp. 310–346, 2 pl., 2 graphs, 1933. [Flemish, German, and English summaries.]

In this paper the author gives a detailed account of his investigations (conducted to obtain data on which curative measures to control die-back of elms might be based) into the biology of *Ceratostomella ulmi* [*R.A.M.*, xiii, p. 196]. The results obtained [which are tabulated, expressed graphically, and fully discussed] may briefly be summarized as follows.

C. ulmi grows with difficulty in liquid media, though media containing peptone suit it fairly well.

In a peptone medium the best growth, judged by weight, occurred at P_H 3·2 and in asparagin at 4·4, while between P_H 4·4 and 7·4 the reaction of the medium exercised no appreciable influence on growth. In media of low initial acidity (P_H more than 5) a mycelium with conidial fructifications of the *Cephalosporium* type develops, while in those of high initial acidity (P_H less than 5) a yeast form predominates. The fungus increases the acidity of the medium, does not reduce colouring agents, and possesses two isometabolic points (P_H values at which growth does not alter the reaction of the medium), one (P_H 3·7) for the mycelial, and the other (P_H 2·9) for the yeast, form. It shows a wide range of adaptability as regards its nutritive requirements.

A study *in vitro* showed that while mercuric chloride and nickel sulphate (1 in 2,000) had very little fungicidal effect on *C. ulmi*, janus green, aniline green, brilliant green (1 in 250,000), chinosol, ethyl mercury chloride (1 in 1,000,000), sunoxol [ibid., xi, p. 622], and malachite green (1 in 2,000,000) were all remarkably active in this respect.

A bibliography of 38 titles is appended.

Hotson (J. W.). **Endothia parasitica in Washington.**—*Mycologia*, xxv, 6, pp. 549–550, 1933.

During the summer of 1932 American chestnuts (*Castanea dentata*) at Seattle, Washington, were found to be attacked by blight due to *Endothia parasitica* [*R.A.M.*, xii, p. 601] not hitherto recorded in the State. All the infected trees were five to eight years old and had been raised in the same nursery from seed from a reputedly healthy region in New York State. The original infections were all at or near the ground, and only one secondary infection was observed on an upper branch. If, as seems probable, the fungus was introduced into Washington on the imported seed, its slow method of attack differs from its behaviour in the eastern

States. Both at Agassiz, British Columbia, and Gunter, Oregon, where the chestnut blight fungus was reported in 1914 and 1929, respectively, the disease appears to have been eliminated.

CURZI (M.). **La 'Phytophthora (Blepharospora) cambivora' Petri sul Noce.** [*Phytophthora (Blepharospora) cambivora* Petri on Walnut.]—*Rendic. R. Accad. Lincei*, xviii, Ser. 6a, 12, pp. 587–592, 1933.

Early writers on the 'ink disease' of chestnuts (*Castanea sativa* M.) in Italy referred to a similar disease, which some thought to be identical, on the walnut (*Juglans regia*), but the cause of the former condition, *Phytophthora cambivora*, discovered by Petri in 1917 [cf. *R.A.M.*, iii, p. 245; vi, p. 380; xiii, p. 65], was not detected on diseased walnuts until isolated by the writer in August 1932, from seedlings growing near chestnut seedlings in a nursery in the vicinity of Rome. Both hosts were affected by a similar disease, which attacked about 70 per cent. of the young walnuts while only scattered chestnut seedlings showed typical ink disease. In both cases a similar phycomycetoid mycelium was present in the cambium and cortical parenchyma and this was isolated in culture from 5 chestnuts and 12 walnuts and proved to be *P. cambivora*, identical with isolations made by the writer from young chestnuts in Sardinia and others obtained from Petri and Dufrénoy in Italy and France, respectively. Inoculations with the two Roman isolations were successful on young walnut and chestnut plants, about 6 cm. in diameter at the base of the stem, the mycelium being inserted into cortical wounds. At the end of three months the brown streaks of infection were 14 and 20 cm. in length on walnut and chestnut, respectively, when the walnut strain was used, and 10 and 30 cm. when that from chestnut was employed, the breadth varying from 1·5 to 4 cm.

It is evident from these results that the collar rot of walnuts frequently recorded in Italy under the names of 'nerume', 'mal nero', and gummosis [ibid., i, p. 284; iii, p. 524] and in France as 'pourridié', 'mourios', etc. [ibid., i, p. 77; vi, p. 563] is more likely to be due to *P. cambivora* than to the other parasitic organisms, such as *Bacterium juglandis* and *Armillaria mellea*, to which it has been attributed. So also the obscure walnut blight reported by Baudyš in Czecho-Slovakia [ibid., x, p. 79] is very possibly of similar origin. In California a walnut disease, the symptoms of which recall ink disease, has been attributed provisionally to *P. cactorum* [ibid., xi, p. 339] and in Australia *P. parasitica* has been recorded as the cause of a collar rot of this tree [ibid., ix, p. 567], but it would appear that these determinations require to be checked, since in California it is stated that more than one species is present [ibid., x, p. 214], while the description of the causal fungus in Victoria seems to resemble that of *P. cambivora* more than *P. parasitica*.

CURZI (M.). **La maladie de l'encre sur le Noyer (Juglans regia).** [Ink disease on Walnut (*Juglans regia*).]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, v, 12, pp. 341–344, 1933.

This is an account in French of the writer's discovery of *Phyto-*

phthora cambivora as the cause of the ink disease ('mal nero') of walnuts in Italy [see preceding abstract].

RIGOTARD (L.). **Le dépérissement du Noyer dans le Dauphiné.** [The dying-off of the Walnut in the Dauphiné.]—*Comptes rendus Acad. d'Agric. de France,* xix, 29, pp. 1007–1012, 1933.

In this note (preceded by an introductory statement by P. Viala), the writer discusses the factors underlying the widespread dying-off of walnut trees in the Dauphiné, the incidence of which has risen, since the excessively severe winter of 1928–9, from an average of 1 or 2 to 4 or 5 per cent. per annum [cf. *R.A M.*, ii, p. 187 and preceding abstracts]. Contributory causes of the damage are believed to be exhaustion and insufficient humidity of the soil, for which appropriate remedies are suggested.

WEBER (G. F.). **Pecans infected with Nematospora coryli Pegl.** —*Phytopath.*, xxiii, 12, pp. 1000–1001, 1 fig., 1933.

Nematospora coryli was isolated from stored pecan [*Carya pecan*] nuts in Florida in January, the organism in pure cultures on potato-dextrose agar being indistinguishable from that previously isolated from orange, grapefruit, tangerine, Satsuma [*Citrus nobilis* var. *unshiu*], and tomato in the same State [*R.A.M.*, xii, p. 594]. This appears to be the first record of the fungus on pecans. Infection cannot be detected until the shells are removed, when it is found on the convex outer portion of the kernels, producing a brown discoloration similar to the kernel spot caused by sucking insects [*Nezara viridula*: ibid., ii, p. 283], with which *N. coryli* is in fact generally associated. The lesions are slightly depressed, shrunken, and show a definite margin; the underlying tissue is flaccid and faintly discoloured. It is thought probable that the fungus is conveyed to the nuts by *N. viridula*, which has been found feeding on a number of hosts from the necrotic areas on which *N. coryli* has been isolated.

STEVENS (N. E.). **Life history and synonymy of Physalospora glandicola.**—*Mycologia,* xxv, 6, pp. 504–508, 1933.

The fungus reported by O. C. Boyd (*Plant Disease Reporter, Suppt.* 85, p. 67, 1933) to be causing twig blight of oaks in Massachusetts and simultaneously investigated by H. S. Jackson near Toronto, Canada, is determined as *Physalospora glandicola* (Schw.) comb. nov. (syns. *Sphaeria glandicola, S. gallae, Sphaeropsis hyalina, S. quercina*, and *Dothiorella quercina*). *P. glandicola* is characterized by simple or compound pycnidia in black, erumpent stromata, 1 to 2 mm. in diameter; light brown, eventually 1-septate pycnospores with a thick, glassy wall, 12 to 17 by 18 to 25 μ, mostly 15 to 16 by 21 to 24 μ; perithecia up to 200 or 225 μ in diameter, with asci containing eight light brown, usually biseptate ascospores, 12 to 16 by 28 to 35 μ (14 to 15 by 30 to 33 μ).

LIESE (J.). **Anzucht gesunder Pappeln- und Aspenpflanzen. II. Teil.** [The cultivation of healthy Poplar and Aspen plants. Part II]—*Forstarchiv,* ix, 7, pp. 111–115, 9 figs., 1933.

Attention is drawn to some prevalent defects in poplar (*Populus*

nigra, *P. canadensis*, *P. robusta*, and other species) and aspen [*P. tremula*] cultivation in Germany, which are liable to promote the heart rot caused by *Polyporus* [*Fomes*] *igniarius* [*R.A.M.*, x, pp. 416, 420]. Of recent years the demand for aspen wood has been so brisk that attempts at propagation by seed were made in various parts of the country, but at any rate in East Prussia the heat wave of 1930 and the ravages of rusts (*Melampsora* spp.) and *Verticillium albo-atrum* in 1932 have counteracted this development.

Servazzi (O.). **Un fungo nuovo del Pioppo canadese (Pyrenochaetina variabilis sp. n.)** [A new fungus on Canadian Poplar (*Pyrenochaetina variabilis* sp. n.)]—*La Difesa delle Piante*, x, 6, pp. 113–122, 1 pl., 1 fig., 1933.

Two-year-old Canadian poplars [*Populus canadensis*] growing in a nursery at Moncestino, Italy, wilted as a result of attack on the cortex of the roots by a *Pyrenochaetina* named by the author *P. variabilis* n. sp. The fungus [the morphological characters of which are fully described and a Latin diagnosis of which is given] was characterized by sparse, black or brownish-black, generally superficial or erumpent pycnidia, averaging 200 to 215 by 160 to 175 μ, usually with an ostiolate papilla; the pycnidial wall was 10 to 15 μ thick and consisted of two or three layers of irregularly polyhedric cells, 3·5 to 6 μ broad. On the surface were 10 to 35 bristles, usually around the ostiole, 65 to 200 μ (averaging 100 to 120 μ) by 2·6 to 3·5 μ in diameter. The hyaline, elliptical or ovoid, occasionally spheroid spores measured 3 to 3·3 by 2·2 to 2·5 μ. No sporophores were observed, the spores being apparently formed pleurogenously on deliquescent hyphae occupying the centre of the pycnidium.

From the abundant mycelium in the living tissues the author deduces that *P. variabilis* is a true parasite of the root cortex. It is, however, a weak one, fatal only to young poplars growing in unsuitable conditions.

Venkata Rao (M. G.). **A preliminary note on the leaf-curl mosaic disease of Sandal.**—*Indian Forester*, lix, 12, pp. 772–777, 2 pl., 1933.

A description is given of a new disease of sandal (*Santalum album*) in Mysore for which the name of 'leaf curl mosaic' is proposed. So far 138 trees have been found affected in the Jakkur plantation, Bangalore, and a few elsewhere.

The early stages of the disease are characterized by conspicuous interveinal mottling and slight rolling of the mature leaves, sometimes accompanied by a reddish-brown marginal discoloration in the pigmented types of sandal. A marked drooping habit is generally shown by the branchlets and foliage. At a more advanced stage even quite young leaves show a marginal ruffling, followed by wrinkling, mottling, progressive dwarfing, curling, and discoloration ranging from greenish-yellow to reddish-brown. In contrast to spike disease [*R.A.M.*, xiii, p. 198], the surface reduction in mosaic leaves is usually greater in length than in breadth. The thickness of the petioles is considerably diminished and the

leaves become brittle and fall prematurely. The twigs and branches die back gradually and adventitious shoots appear on the stem, producing very attenuated leaves that are rapidly shed. The fruits of diseased trees are malformed and fall prematurely. A table is given showing the principal differences between leaf curl mosaic and spike disease.

In order to determine the transmissibility of the new disease, two five-year-old sandal trees raised from seed were inoculated at the Central Nursery, Bangalore (nearly six miles from the infected plantation at Jakkur) with six ring-bark grafts on different twigs among the lower branches. In this method the healthy twigs are girdled by removing the bark all round to a width of about an inch and replacing it with that of an infected twig of corresponding dimensions, the part being then bandaged. In these tests the grafting material was taken from two trees in the final stage of the disease. Twenty-five days after inoculation, the new leaves produced in some of the upper branches showed distinct marginal ruffling, followed in about a fortnight by severe wrinkling. Six weeks after inoculation nearly half the branches in the trees were affected, and small curled leaves were produced by an adventitious shoot on one of the lower branches. Mottling began to develop two months after inoculation. These symptoms were confined to the new leaves developing after the grafting operation, and generally appeared first on the vigorously growing upper branches, only two out of twelve of those actually inoculated in the lower parts of the trees becoming affected. These data are considered to indicate that leaf curl mosaic, unlike spike, spreads very rapidly from one part of an infected tree to another.

LACHMUND (H. G.). **Mode of entrance and periods in the life cycle of Cronartium ribicola on Pinus monticola.**—*Journ. Agric. Res.*, xlvii, 10, pp. 791–805, 1 diag., 1933.

The results of ten years' field studies in western North America of the early stages of blister rust (*Cronartium ribicola*) on the native western white pine (*Pinus monticola*) [*R.A.M.*, xii, p. 603] showed that on trees over 3 ft. in height and more than 8 years old the duration of the incubation period to the production of visible bark symptoms usually ranges from about 20 to 26 months, but is sometimes considerably longer, depending on the time of infection, seasonal conditions, and altitude. After infection the minimum time required for canker formation in such trees is generally not less than 16 months, although recent data from Idaho indicate that in certain cases the minimum might have been as low as 9½ months. On younger trees, not over 5 years old, the incubation period is shorter, and incipient cankers were observed to form after a minimum of 6 months.

The time required for the production of pycnospores after the incubation period ranges from less than 1 month to 10 months. Aecidiospores are usually formed from 6 months to 2½ years after the production of the pycnospores, but sometimes the intervening period extends over 3 or even 4 years, and under certain conditions occasionally ranges as high as 10 to 20 years. On the younger trees it rarely extends beyond 2½ years.

Bagchee (K.) [D.]. **Investigations on the infestation of Peridermium himalayense, Bagchee, on Pinus longifolia. Part II. Cronartium himalayense, n. sp., on Swertia spp. Distribution, morphology of the parasite, pathological study of the infection, biological relationship with the Pine rust, and control.**—*Indian Forest Records* (Bot. Ser.), xviii, 11, 66 pp., 16 pl. [1 col.], 2 graphs, 1933.

In this paper the author gives a full account of his investigations of the biological relationship between *Peridermium himalayense* (the serious blister rust attacking *Pinus longifolia* in north and north-western India) and its *Cronartium* stage, *C. himalayense* n. sp. (*Uredo opheliae* Syd.) found on species of *Swertia* in the same region [*R.A.M.*, ix, pp. 146, 279], as well as into the morphology of *C. himalayense*, its manner of infection, and its possible control.

C. himalayense is characterized by caulicolous, sub-phellodermal, small, inconspicuous, scattered pycnidia forming minute, blister-like swellings with an orange-yellow exudation. The aecidial (*Peridermium*) and uredo stages have been described in earlier publications. The hypophyllous, cylindrical, walnut-brown teleutosori (which occur on all the green parts of the affected species of *Swertia*) measure 750 by 80 μ on an average; the light brown, cylindrical to polyhedral, occasionally spindle-shaped teleutospores have rounded corners or are obtuse at both ends, and average 37·5 by 18·5 μ; they have a smooth wall 0·08 to 2·5 μ thick. The delicate, hyaline, globoid sporidia measure 5·5 to 6·5 μ in diameter.

S. alata, S. angustifolia, S. cordata, S. paniculata, and *S. purpurescens* were inoculated with aecidiospores from the stem of *P. longifolia* and two weeks later the uredo stage was reproduced on *S. alata, S. angustifolia*, and *S. cordata* (the first two of which became heavily and the third slightly, infected). These are the three species that have been found naturally infected.

The aecidiospores of *C. himalayense* are capable of dissemination by the wind over long distances. The uredospores chiefly spread infection locally on *Swertia*. The teleuto stage produces a large quantity of sporidia just before or after the host dies. Their formation has been observed from the middle of October to the middle of November. The structure of the spores indicates that they are capable only of local dissemination, but they are produced in sufficient quantity to cause heavy reinfection of pines in the neighbourhood.

The only suitable method of controlling this pine blister rust consists in eradicating the alternate host. As the range of aecidiospore dissemination was tentatively determined as 300 yards, pine stands should be kept at this distance from *Swertia* spp. A scheme has been suggested for the eradication of *Swertia* for three successive years and thereafter during alternate years for six eradication years in certain areas. Pines over 30 years old appear to remain unaffected by the disease.

Clark (A. F.). **The horntail borer and its fungal association.**—*New Zealand Journ. of Sci. & Techn.*, xv, 3, pp. 188–190, 1933.

A fungus, which appeared to agree with a standard culture of

Stereum sanguinolentum [see above, p. 334] from England, has been found almost constantly present in the wood of *Pinus radiata* infested with the horntail borer, *Sirex noctilio*, in New Zealand, as well as on the larvae and adult females of the insects in the trees. Cartwright has shown in England that *S. cyaneus* introduces the accompanying Basidiomycete into the wood on the accomplishment of oviposition, and it is apparent also from the present studies that the connexion between insect and fungus is extremely close. In fact, infestation by the former seems to depend on the presence of the latter in the host.

CUMMINS (J. E.). **Blue stain in Pinus radiata (insignis) timber. Some preliminary experiments with case stock.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 4, pp. 244–252, 1 fig., 1 pl. [opp. p. 308], 1933.

Owing to the increased use in Australia of locally grown softwoods the problem of the development of blue sap stain during stacking has become of major importance. This stain on *Pinus insignis* from two localities in Victoria was recently found by Miss A. M. Eckersley to be due in one locality to two fungi closely related to *Ceratostomella pilifera* [*R.A.M.*, x, pp. 146, 216] and *C. coerulea* [cf. ibid., xi, p. 216] and in the other to *Hormonema dematioides* [ibid., ix, p. 77; xi, p. 616]. *P. insignis* is largely used for making cases, but is often insufficiently seasoned so that the development of blue stain is common.

In a test [full details of which are given] carried out at one factory a large number of boards of *P. insignis* cut the day before were completely immersed for not less than ·5 seconds in a cold solution of lignasan, an American proprietary substance stated to contain 0·43 per cent. ethyl mercury chloride [ibid., xii, pp. 345, 668], made by dissolving ½ lb. of the dry powder in 20 galls. of cold water, or in a solution (maintained at 140° F.) made by dissolving 14 lb. of washing soda and 6 lb. bicarbonate of soda in 20 galls. water, after which they were stacked either 'lap' or 'strip' fashion for about nine weeks, untreated boards being similarly stacked as controls.

The lap-stacked, untreated boards and those treated with soda had 71 and 40 per cent., respectively, of the total area blue-stained, whereas the lignasan-treated boards showed no stain at all. Of the strip-stacked, untreated boards 31 per cent. of the total area was stained, whereas no stain developed in the lignasan-treated boards.

Both the treatments apparently favoured the development of surface moulds other than the blue stain fungi, possibly by increasing the P_H value of the surface of the wood. Rapid drying in the stack diminished this effect of the lignasan treatment.

NIKOLAYEVA (Mme T. L.). Род **Merulius** в СССР. [The genus *Merulius* in USSR.]—*Советская Ботаника* [*Botany of the Soviets*], *1933*, Leningrad, 5, pp. 96–111, 12 figs., 1933.

In this paper the author gives brief Russian technical descriptions of 17 species of *Merulius* (including *M. domesticus*, *M. minor*, *M. silvester*, and *M. sclerotiorum*, which were separated from *M.*

lacrymans by Falck in 1907, and which are accepted as distinct species by the writer) [*R.A.M.*, viii, p. 280], together with notes on their taxonomy and geographical distribution, as well as on the substrata on which they are most commonly found in nature. Five of the species named have not yet been recorded on the territory of the Russian Soviets. A key for the identification of the species is given.

Wilson (S. E.). **Changes in the cell contents of wood (xylem parenchyma) and their relationships to the respiration of wood and its resistance to Lyctus attack and to fungal invasion.**—*Ann. of Appl. Biol.*, xx, 4, pp. 661–690, 11 figs., 1933.

The main part of this paper is given to an account of experiments, the results of which showed that the starch normally present in the sapwood of felled timber disappears in the course of a slow seasoning process, for a period varying with the species of tree, the season of felling, the width of the sapwood, and temperature. The experiments further suggested that the disappearance of the starch results from the continued activity of the sapwood cells. When the latter are killed by rapid seasoning, the starch remains unaltered in the timber, and such timber is very liable to attack by the *Lyctus* powderpost beetles and by fungi. The latter fact was demonstrated by observations that ash planks which had been cut shortly after felling became discoloured, while planks sawn from logs six or more months after felling remained 'bright'. Examination of the former showed the presence of brown fungal hyphae in the wood to a depth corresponding to the starch zone. Comparative infection tests with an unidentified species causing sap stain showed that blocks of rapidly air-dried, steamed, or oven-dried ash sapwood were stained throughout after five weeks, while starch-free blocks of the same wood showed only a slight growth of the fungus and no internal discoloration.

Moll (F.). **Neue Versuche über Holzkonservierung. Das Osmose-Verfahren.** [New experiments in wood preservation. The osmosis process.]—*Forstwissensch. Centralbl.*, lv, 21, pp. 755–757, 1933.

Attention is drawn to the recent establishment, near Goslar in the Harz Mountains, of a plant for the preservation of timber by osmosis, the basis of which consists in the application to the freshly felled, decorticated wood of a protective paste combined with water as a solvent and an adhesive. By diffusion and osmosis, the highly concentrated protective substances migrate in the direction of low concentration, i.e., the interior of the wood. After the application of the paste the logs are piled up and covered with temporary roofing to keep them dry and prevent the evaporation of the water. Pine and spruce logs of the normal dimensions for telegraph poles and the like are impregnated in the course of ten or twelve weeks by this process. The paste may also be applied to the standing tree just above the root collar, a strip of the rind of which is removed for the purpose. The protective salts are carried upwards with the rising sap, and within a few days the

subcortical tissues are rendered safe from infection, e.g., by the blueing fungi [*Ceratostomella* spp.].

ANDERSON (M. E.). **Fusarium resistance in Wisconsin Hollander Cabbage.**—*Journ. Agric. Res.*, xlvii, 9, pp. 636–661, 3 figs., 1 graph, 1933.

An account is given of the author's studies since 1930 in Wisconsin of the genetical nature of resistance to cabbage yellows (*Fusarium conglutinans*) [*R.A.M.*, xiii, p. 2] in the Wisconsin Hollander cabbage variety [ibid., x, p. 4], as indicated by the behaviour in the field and under controlled conditions in the greenhouse of different progenies of self-pollinated plants and crosses of the variety with homozygous resistant and homozygous susceptible plants from other varieties. Under severe field conditions the F_1 self-pollinated progeny was found to comprise individuals ranging from completely susceptible to highly resistant, indicating the existence of modifying factors for resistance. The F_2 progeny of the crosses with homozygous susceptible plants did not contain individuals with the original resistance of Wisconsin Hollander, while that of the crosses with homozygous resistant plants, when grown in inoculated soil at a constant soil temperature, segregated in the ratio of three resistant to one susceptible. Segregation of factors for resistance was also observed in the F_1 and F_2 progenies from the Hollander self-pollinated plants, some of the F_2 progenies exhibiting a higher and others a lower degree of resistance than the progenies from which the mother plants had been selected. Many plants of the more resistant progenies showed but slight symptoms in the field or at a controlled soil temperature of 20° to 22° C., their growth not being materially checked by the disease, and recovery being frequent.

At temperatures above 22°, however, the resistance of Wisconsin Hollander tends to be broken; the most resistant line of self-pollinated plants which was obtained in the work became 100 per cent. diseased at a constant soil temperature of 24°. This would indicate that the resistance of this variety is of an intermediate degree, as compared with that of homozygous resistant lines [loc. cit.]. There was no evidence of increased resistance of Wisconsin Hollander seedlings with advance in age, within the limits studied.

TENNENT (R. B.). **The Bruce club-root resistant Turnip.**—*New Zealand Journ. of Agric.*, xlvii, 5, pp. 297–301, 1933.

In a field trial of resistance to *Plasmodiophora brassicae* carried out in New Zealand in 1931 Bruce Purple Top turnips (English and Scotch seed) [*R.A.M.*, xii, p. 6], the Wallace Green Top selection from it, and Purple Top Aberdeen developed 8·3, 5·2, 10·1, and 25·8 per cent. infection, respectively; the Bruce and Wallace roots also proved superior in yield and quality as fodder. In a large-scale test carried out the following year with Bruce, Green Top Scotch Aberdeen, and Botfield the corresponding figures were, respectively, 2·3, 6, and 44 per cent. Numerous trials conducted by the local farmers fully confirmed the resistance to *P. brassicae* shown by the Bruce variety.

MAGEE (C. J.). **Whiptail disease of Cauliflowers can almost be eliminated by liming.**—*Agric. Gaz. New South Wales*, xliv, 12, pp. 911–914, 2 figs., 1933.

In New South Wales certain cauliflower varieties, especially early ones, are seriously affected nearly every year by the physiological disorder, due to high soil acidity, known as whiptail [*R.A.M.*, iii, p. 565]. Quite commonly every plant in a crop is affected, though more often 20 to 50 per cent. of the plants of early varieties may show the condition.

The results of an experiment on control by liming [details of which are given] are considered to justify a tentative recommendation of a dressing of one and a half to two tons of agricultural hydrate of lime per acre, at least one month before the seedlings are set out. The seed-bed should also be limed some weeks before sowing, at the rate of 1 lb. hydrate of lime per sq. yd.

KENDRICK (J. B.). **Seedling stem blight of field Beans caused by Rhizoctonia bataticola at high temperatures.**—*Phytopath.*, xxiii, 12, pp. 949–963, 3 figs., 1 graph, 1933.

A destructive stem blight of Red Mexican, Red Kidney, and Pink bean (*Phaseolus vulgaris*) seedlings in the central valleys of California is caused by *Macrophomina phaseoli* in its sterile stage (*Rhizoctonia bataticola*) [*R.A.M.*, xii, p. 763]. The average mean diameter of the sclerotia consistently isolated from diseased material (no pycnidia were found) was 75·4 μ, indicating that the organism falls within Haigh's C group [ibid., xii, p. 727]. The disease is characterized by black, sunken lesions on the upper part of the hypocotyl, sometimes involving the epicotyl and plumule and rapidly killing the plant. When not destroyed in the seedling stage, affected plants often collapse later at the point where the stem is weakened by the canker. Infection occurs on the hypocotyl at the base of a cotyledonary petiole before or soon after the emergence of the seedling from the soil, possibly through the meristematic tissue in this region.

Epidemics of stem blight coincided in 1929, 1931, and 1932 with the emergence of the seedlings during or immediately following periods of ten days or more with mean air temperatures of 80° F. or above and a daily maximum of about 100°. No such periods occurred in 1930 and epidemics were absent. Bean seedlings in pots of sterilized, inoculated soil contracted typical seedling blight in two series of tests in June and July, 1931, when the daytime soil temperatures averaged 95° to 113° and 98° to 107° at 1 in., and 81° to 95° and 82° to 89° at 3 in., but not during two series in September and October with corresponding averages of 74° to 82° and 72° to 80°, and 69° to 76° and 69° to 77°, respectively.

BRUNER (S. C.) & JENKINS (ANNA E.). **Identity and host relations of the Elsinoe of Lima Bean.**—*Journ. Agric. Res.*, xlvii, 10, pp. 783–789, 1 fig., 1933.

The results of inoculation experiments [which are described in detail] from 1930 to 1932 at the Agricultural Experiment Station at Santiago de las Vegas, Cuba, supported by field observations, showed that the species of *Elsinoe* which causes Lima bean

(*Phaseolus lunatus*) scab, and which had been tentatively identified as *E. canavaliae* [*R.A.M.*, x, p. 577; xiii, p. 72], is not pathogenic to *Canavalia gladiata*, *C. ensiformis*, *Calopogonium caeruleum*, *Dolichos lablab*, *Stizolobium deeringianum*, French beans (*P. vulgaris*), or peas. For this reason, and until the other two species of *Elsinoe* recorded on legumes, namely, *E. canavaliae* and *E. calopogonii*, have been studied further, the authors consider it advisable to regard the Lima bean organism as a distinct species, for which the name *E. phaseoli* Jenkins is suggested. An English technical description and a Latin diagnosis of this species are appended.

McRae (W.) & Shaw (F. J. F.). **Influence of manures on the wilt disease of Cajanus indicus Spreng. and the isolation of types resistant to the disease.**—*Imper. Council of Agric. Res., Scient. Monograph* 7, 68 pp., 2 pl., 13 graphs, 1933.

Studies at the Pusa Agricultural Research Institute, India, of the effect of different manures on wilt (*Fusarium vasinfectum*) of pigeon pea (*Cajanus indicus*) [*R.A.M.*, x, p. 399; see also xi, pp. 424, 426] in permanent manurial plots showed that applications of superphosphate at the rate of about 13 lb. of P_2O_5 per acre or of farmyard manure at the rate of 30 lb. of nitrogen per acre or of superphosphate and green manure together increased infection, whereas green manure alone reduced it. Chemicals other than the superphosphate had no effect on the incidence of the disease. Each year there was a statistically significant difference between the amount of infection in the green manure plus superphosphate plots and that in the plots treated with superphosphate alone, demonstrating that the green manure prevented the superphosphate from producing its full effect in increasing wilt.

Evidence was obtained that in unmanured, highly infected land 92 per cent. of the plants might become infected, and that plants 9 ft. distant from a point where infection existed at the beginning of the season might develop wilt. The incidence of infection did not correspond with the amount of soil moisture and the difference in the P_H values of the soil in the various plots was too slight to account for the difference in the amounts of infection present in them; in culture the fungus grew well at P_H values corresponding to those of the plots.

The average stem diameter of the plants in the superphosphate plots was 50 per cent. greater than that of the plants in the plots not given superphosphate, while the average weights of the shoots at harvest time (four seasons taken together) for two series of superphosphate plots were, respectively, 47 per cent. and 37 per cent. higher than those of the shoots in plots not given superphosphate.

In a given time the rate of growth of the mycelium of *F. vasinfectum* in liquid media containing different amounts of soluble phosphate increased with the concentration of the phosphate up to 0·5 per cent., after which it declined.

During 1923, plants which had survived in an artificially infected field were selected and seed from each was sown separately in the same field in 1924–5; of the resulting lines two (3 and 16) were

found to incur less loss than the remainder. The single lines fell into certain morphological groups and it became apparent that resistance was correlated with the morphological features of one of these, the group I (1), and a line (type 82) obtained from an extraneous series, while susceptibility appeared to be associated with those of types 5, 15, and 59. Selections from line A2 of group I (1) yielded a type (80) which since 1930 has shown resistance in field trials in infected land. In 1927–8 and 1928–9 (figures for these years being chosen because wilted plants were in both seasons very much fewer than they were, on an average, for the previous six years) the plots from mixed seed showed 3,594 and 5,701 wilted plants, respectively, whereas in 1929–30 and 1931–2 the type 80 plots showed only 131 and 3 wilted plants, respectively. Six pairs of plots each of one quarter of an acre and on highly infected soil were sown with seed of types 5 and 80 in alternate rows, the seed of the former type giving 2,384, and that of the latter 70 diseased plants, the type 5 plots averaging 63 and type 80 plots 1·7 per cent. wilted plants. It is considered that the resistance of type 80 is of a very high order.

The evidence obtained indicated that resistance is inherited independently of morphological characters. A resistant variety of pigeon pea grown in a field which has been under this crop for three or more seasons loses its resistance, though this factor is not transmitted to the next generation, the soil conditions responsible affecting the soma but not the germ tissue of the plants.

Types 16, 41, 50, and 51, obtained from the same series as type 82, also showed some resistance.

SATTAR (A.). **On the occurrence, perpetuation and control of Gram (Cicer arietinum L.) blight caused by Ascochyta rabiei (Pass.) Labrousse, with special reference to Indian conditions.**—*Ann. of Appl. Biol.*, xx, 4, pp. 612–632, 1 map, 3 graphs, 1933.

An account is given of the results obtained so far in the investigation, started in 1922, of the very destructive blight of gram (*Cicer arietinum*) caused by *Ascochyta rabiei*, particularly in the north of the Punjab [*R.A.M.*, xii, p. 264]. The disease is most prevalent and destructive in regions with a rainfall of 6 in. and over during the period from October to April when the crop is on the land, annually killing some 50 per cent. of the plants; when the rainfall during this period is under 6 but not under 3·5 in. the annual losses are estimated at roughly 25 per cent., while in drier areas the blight occurs rarely and does not cause appreciable injury. It is calculated that in the three districts of Attock, Rawalpindi, and Jhelum, alone, the annual losses caused by it amount to a million rupees [£75,000].

The susceptibility of the plants was found to increase with age, being greatest at the flowering and fruiting stages from February to April, at which time the plant excretes the largest amount of malic acid from the glandular hairs on its surface. Germination of the pycnospores is favoured by the presence of malic or tartaric acid or of acidified carbon (glucose) nutrients (P_H 2·5). In testing the resistance of gram varieties to the blight, inoculations should

be made at the flowering and fruiting stages, as otherwise even susceptible varieties may show a deceptive appearance of resistance.

Though the fungus is carried inside the seed from diseased plants [loc. cit.], the chief mode of transmission from year to year is through seed superficially contaminated with the spores during threshing, experiments having shown that 50 per cent. of such spores germinated after five months' storage at temperatures from 25° to 30° C., and 5 per cent. survived the same period of storage at 35°. Plants raised from seed smeared before sowing with spores of *A. rabiei* were attacked to the extent of 60 to 100 per cent. Infected plant material admixed in the seed was also shown to be an important source of infection, but no definite conclusions could be arrived at in regard to the part played by soil infection in the perpetuation of the disease.

The author considers that the disease could be best controlled by the use of clean seed from disease-free districts, disinfecting contaminated seed in 0·5 per cent. copper sulphate solution for 10 minutes, and treating internally infected seed by pre-soaking in water at 20° C. for six hours, and then dipping it in hot water at 53° for 15 minutes. In a preliminary series of tests, artificially infected gram seeds which were dusted with malic acid before sowing germinated normally, but all the seedlings died off from severe infection when 1 to 1½ in. high. This suggests the possibility of using this method for preventing seedlings from infected seeds from reaching the surface of the soil if planted sufficiently deep. The introduction of a system of crop rotation wherever possible, and the removal of all refuse of the preceding crop from the fields, are also recommended.

Neuwirth (F.). **Ökologie der aufgehenden Rübe mit Berücksichtigung ihrer Krankheiten. Die fakultativen Parasiten, ihr gegenseitiges Verhältnis und ihre Beziehung zur Wirtspflanze. I. Teil.** [The ecology of the germinating Beet with reference to its diseases. The facultative parasites, their mutual relationship, and their connexion with the host plant. Part I.]—*Zeitschr. für Zuckerind.*, lviii, 13, pp. 97–103, 1933.

In this paper (translated from the Czech original in *Listy Cukrovar.*, li, p. 309, 1933, by V. Czurda) the writer pursues his studies on the ecological factors influencing the occurrence of disease in germinating beets [*R.A.M.*, x, p. 425]. It was clear from inoculation experiments with *Phoma betae* on sterilized beet slices in 1927-8 that the fungus secretes thermostable toxic enzymes which penetrate the tissues by osmosis in advance of the hyphae. The cellulose membranes are dissolved by cellulase, the secretion of which by the fungus was established by its ability to use filter paper in artificial culture as the sole source of carbon. A further production of toxic enzymes by the fungus takes place on the flower sheath and parts of the germinating seed cluster. Seed treatment reduces this source of infection but does not wholly eliminate the risks, since the liability of the seedling to disease is far greater at the stage of sloughing the primary root cortex, on which the various fungi involved in the production of seedling blight can readily pass from the saprophytic to the parasitic mode

of life. The dangerous period of temporary growth check, before the depleted seed reserves have been replenished by root feeding, may be curtailed by the provision of exceptionally favourable growth conditions. The straw manure commonly applied to improve the physical condition of the soil and combat root rot must be well worked in and evenly distributed, otherwise its organic substances stimulate the saprophytic development of the pathogens. Most authorities are agreed that the hypocotyl is an important site of invasion by the root-rotting fungi, presumably owing to its high nutrient content, especially of invert sugar.

WERNECK (H. L.). **Die Cercospora-Blattfleckenkrankheit der Zuckerrübe und ihre Bekämpfung.** [The *Cercospora* leaf spot disease of the Sugar Beet and its control.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, xi, 8, pp. 183–192, 1933.

Heavy losses, estimated at 10 to 55 per cent. of the beet crop, were again caused in Upper Austria in 1932 by *Cercospora beticola* [*R.A.M.*, xi, p. 19], roughly corresponding to a financial reduction of M. 384,000 to 480,000 for the raw material and of M. 1,800,000 for manufactured sugar. A study of the local meteorological data for 1932 indicates that ideal conditions for the spread of a leaf spot epidemic prevailed from mid-July onwards, when the optimum temperature (20° C. and above) and atmospheric humidity (98 to 100 per cent.) for the growth of the fungus frequently coincided. The best time for the application of Bordeaux mixture to the beet crop in Upper Austria would appear to be from 10th to 18th August, but this treatment having been found unprofitable in Germany [ibid., xi, p. 348], careful experimentation is advisable before adopting it. As in the 1929 epidemic, the writer again observed in 1932 that the application of liquid manure at or immediately after the second hoeing (1st to 5th July at the latest) practically prevented infection, and this is undoubtedly the simplest and cheapest way to hold the disease in check.

VERPLANCKE (G.). **Betteraves fasciculées.** [Fasciculate Beetroots.]—*Sucrerie Belge*, liii, 7, pp. 123–124, 1933.

Beetroots affected by heart rot in Belgium [*R.A.M.*, xiii, p. 210] were observed to develop a crown of small heads round the collar, presumably representing an attempt on the part of the plant to produce new buds. The same phenomenon was artificially induced at the Ghent Botanic Garden by wounding. In addition, therefore, to the hereditary type of fasciation described by Munerati (*Comptes rendus Soc. de Biol.*, cxi, p. 603, 1932), there exists a non-transmissible form due to mechanical injury or pathological causes.

NATTRASS (R. M.). **The white rot disease of Onions in Cyprus.**—*Cyprus Agric. Journ.*, xxviii, 4, pp. 98–100, 2 figs., 1933.

After stating that the export of onions from Cyprus has risen from 7,721 cwt. in 1928 to 31,080 cwt. in 1932 the author reports that the crop in one locality was attacked in 1933 by *Sclerotium cepivorum* [*R.A.M.*, xii, pp. 4, 140], this being the only serious onion disease so far noticed in the island. The white rot symptoms are briefly described and emphasis is laid on the necessity of

planting sets obtained only from disease-free areas; in the affected locality the cultivation of plants of the onion family should be discontinued for eight to ten years.

ABDEL-SALAM (M. M.). **Damping-off and other allied diseases of Lettuce.**—*Journ. Pomol. and Hort. Science,* xi, 4, pp. 259–275, 2 pl., 5 graphs, 1933.

From damped-off lettuce seedlings growing in heated frames, and older plants bedded out in unheated greenhouses near Slough, England, the author isolated most frequently *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, vi, p. 651; xii, p. 133] and a *Pythium*. The latter occurred chiefly in warm soils, in which *C. solani* was rarely isolated from the damped-off lettuce seedlings. A strain of *C. solani* isolated from the rotted collar of a tomato plant growing in a hot greenhouse and differing from the lettuce strains in growth habit and physiological reaction was highly pathogenic to lettuce.

In a more or less saturated atmosphere the optimum soil moisture for attack by the lettuce and tomato strains of *C. solani* was 80 to 90 and 30 per cent., respectively. At 100 per cent. soil saturation the former caused 42 and the latter 58 per cent. damping-off. When lettuce seeds were sown in 100 per cent. saturated soil inoculated with *Pythium*, all damped off, most of them when germination was beginning. Damping-off occurred (especially with the tomato strain of *C. solani*) in soils showing only 20 per cent. saturation. Once begun, damping-off continued even in atmospheres with only 5·1 per cent. saturation.

At soil temperatures of 8° to 30° C. the *Pythium* gave 100 per cent. infection. The optimum temperature for attack by the lettuce strain of *C. solani* was not over 8°, while that for attack by the tomato strain was about 25°.

The lettuce strain of *C. solani* gave a high percentage of attack in leaf mould soil, a low one in sand, and an intermediate figure in various soil mixtures; approximately 100 per cent. attack was obtained in all soil mixtures inoculated with the *Pythium*.

Both strains of *C. solani* attacked by means of a spongy infection cushion below which numerous penetrations took place, while the *Pythium* penetrated the epidermis by single hyphae. All three organisms passed through the cuticle by means of peg-like hyphal outgrowths which after penetration resumed their normal thickness. The hyphae of the lettuce strain of *C. solani* were mainly intercellular and those of the tomato strain and the *Pythium* mainly intracellular.

No evidence was obtained of any action in advance of the hyphal growth on the part of *Pythium* and the lettuce strain of *C. solani*, though there was evidence of lethal action in the collapse of cells beyond the fungus in the tomato strain of the latter organism. The brown colour of the water-soaked region in lettuce seedlings attacked by the three fungi was due to discoloration of the walls of the host cells.

HIURA (M.) & KAWADA (S.). **On the overwintering of Peronoplasmopara cubensis (B. et C.) Clinton.**—*Japanese Journ. of Botany,* vi, 4, pp. 507–513, 1 pl., 1933.

Early in 1933 many cucumber leaves infected by downy mildew

(*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) were collected in a greenhouse at the Gifu Agricultural College, Japan [*R.A.M.*, viii, p. 698], and some time later a few of these, especially the small upper ones of severely diseased plants, were found to contain oospores. The connexion between these organs and the mycelium was readily traced by the dissection of detached lesions immersed for not less than 24 hours in 20 per cent. potassium hydroxide. From June onwards oospores are found even in young lesions showing little discoloration, while mature oospores are commonly present in the lesions of apparently vigorous leaves attached to the plant. The oogonia of *P. cubensis* are obovoid to ellipsoidal or irregularly piriform, 28 to 56 by 24 to 44 μ, the antheridia clavate to globose, 14 to 22 by 10 to 16 μ, and the spherical, rarely obovoid to ellipsoid oospores, with a hyaline to pale yellowish, smooth wall, 1·5 to 3·5 μ in thickness, measure 22 to 42 μ in diameter. The oospores found by Rostowzew (*Flora*, xcii, p. 405, 1903) in cucumber lesions had undulate-verrucose walls and were thus evidently distinct from those found by the authors. The only other worker who mentions seeing oospores is Tanaka in 1890, but he gave no description of them. The results of the writers' investigations are considered strongly to suggest the possibility of the overwintering of the fungus in the soil.

Brown (J. G.). **Watermelon susceptible to Texas root rot.**—*Science*, N.S., lxxviii, 2031, p. 509, 1933.

Contrary to statements that watermelons are resistant to, or immune from, Texas root rot (*Phymatotrichum omnivorum*), the writer and his colleagues have found that this plant is liable to extensive infection in Arizona, both when planted in infested soil and inoculated in the field or laboratory. In mixed cultures of *P. phymatotrichum* and *Trichoderma lignorum*, the hyphae of the former were injured or killed by the attacks of the latter [cf. *R.A.M.*, xii, p. 192].

Richardson (J. K.). **Eggplant wilt.**—*Scient. Agric.*, xiv, 3, pp. 120–130, 3 pl., 1 graph, 1933.

After describing the symptoms of eggplant wilt (which has become so prevalent in southern Ontario that the crop has been largely discontinued) the author states that as all his isolations from diseased eggplants produced pseudosclerotia in culture he tentatively identifies the causal organism (the pathogenicity of which was established) as *Verticillium dahliae* [*R.A.M.*, xii, pp. 470, 494]. The fungus was obtained from all parts of the plant, including seed aseptically removed from fruits which showed severe vascular browning.

The organism grew at temperatures between 8° and 34° C. and within a P_H range of 2·3 and 9, optimum growth occurring between 21° and 24° and above P_H 5·4 [ibid., xi, p. 626]. Typical wilt was produced at soil temperatures of 11° to 30°, and none of the five varieties of eggplants studied showed appreciable resistance to the disease.

Soil applications of mercuric chloride before and after setting

out the plants gave definite control under greenhouse conditions and considerably retarded the progress of infection in the field.

The paper concludes with brief recommendations for control by seed and soil sterilization, the use of clean seed, rotation, and improved sanitary methods, and there is a bibliography of 21 titles.

Faes (H.), Staehelin (M.), & Bovey (P.). **La lutte contre les ennemis de la Vigne en 1932.** [The campaign against Vine pests in 1932.]—*Ann. Agric. de la Suisse*, xxxiv, 10, pp. 1147–1159, 1933.

Owing to the low night temperature prevailing in the Lausanne district of Switzerland during May and June, 1932, the first severe outbreaks of mildew were delayed until early July; thenceforward the disease assumed a very severe form, attacking the leaves, flowering bunches, and (in the 'brown rot' phase) the fully developed fruit. Immense damage was caused in the vineyards of Valais and in certain French viticultural regions during this period of high temperatures and excessive humidity. Excellent results were again given by six applications of Bordeaux mixture at normal strength with an adhesive. Cupro-Maag (5 per cent.) [*R.A.M.*, xiii, p. 171] also proved very satisfactory, while cusisa dust [ibid., xi, p. 764] was quite efficacious; in general, however, the exclusive use of dusts in the control of downy mildew cannot be recommended under Swiss conditions. Adequate protection in the early stages of the epidemic was conferred by certain colloidal copper preparations, the effects of which, however, did not persist through July and August. An organic colouring substance known as 'hélion orange' [ibid., xi, p. 221] gave disappointing results.

The causal organism of 'coître' (*Coniothyrium diplodiella*) collected in 1920 and 1921 proved to be still capable of infecting grapes in 1932 but in a distinctly attenuated form [ibid., xi, p. 692]. Encouraging results in the control of this disease were given by 1 per cent. verdet [copper acetate] and by 0·5 per cent. potassium bisulphite with 1 per cent. black soap, which reduced the incidence of infection from 81 in the control to 44 and 35 per cent., respectively, when applied 24 hours after inoculation.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, July–September, 1933. Quarantine and other official announcements.—pp. 197–243, 2 maps, 1933.

Summaries are given (pp. 218–224) of regulations governing the importation of plants into Jamaica (as brought up to 4th August, 1933); Greece (potatoes against insect pests and *Synchytrium endobioticum*, 30th September, 1933); and British Honduras (prohibiting the importation of tobacco seeds except under licence, 30th September, 1933).

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, v, 5, pp. 150–151, 155–160, 1933.

Iraq. Customs Tariff Law No. 11 of 29th April, 1933, requires that citrus fruits and cuttings and grape vine fruit, leaves, and

cuttings destined for importation into Iraq shall be accompanied by a duly authenticated certificate from the country of origin vouching for their freedom from disease. Excepting when imported under permit for scientific research purposes, consignments of plants with woody stems and all parts thereof, cotton seeds, flower bulbs, grains, roots, and tubers (other than potato) will be subjected to inspection by agricultural officials and, in the event of disease, either disinfected or destroyed.

HOLLAND. The Flower Bulb Export Order 1932, giving effect to the Act of 31st December, 1931, and coming into force on 20th January, 1933, provides for the inspection by qualified officials of all flower bulbs destined for export from Holland with a view to determining their freedom from disease and generally satisfactory condition. The bulbs must be packed in such a way as to ensure their protection from contamination from any accompanying plants. Directions are given relative to the inspection, and to the issue and validity of phytopathological certificates.

DE HOOGH (J.). **Iepenziekte bestrijding.** [Elm disease control.] —*Nederl. Boschbouw-Tijdschr.*, vi, 11, p. 402, 1933.

An explanation is given of the Royal Decree of 26th September, 1933 (effective as from 1st October, 1933), prohibiting the piling and transport of elm logs in Holland during the flying period of the bark beetles [*Scolytus scolytus* and *S. multistriatus*], i.e., from 15th March to 1st October, with a view to preventing the dissemination of the elm disease [*Ceratostomella ulmi*: *R.A.M.*, xii, p. 737]. Exempt from this general restriction are completely decorticated wood [cf. ibid., xiii, p. 64]; material with a diameter of less than 7 cm. or originating from branches or twigs less than 7 cm. in diameter; submerged wood; and wood of which the entire bark has been treated with cabinet-maker's carbolineum or some other preparation approved by the Minister of Economic Affairs.

MALLAMAIRE (A.). **Legislative and administrative measures. French West Africa (Ivory Coast.)**—*Internat. Bull. of Plant Protect.*, vii, 12, p. 272, 1933.

A Decree of 28th July, 1933, prohibits the sale and transport in the Ivory Coast of banana suckers from plantations known to be infected by stem rot (*Marasmius stenophyllus*) [*R.A.M.*, xi, p. 97] or Panama disease (*Fusarium cubense*) [*F. oxysporum*], certificates of freedom from which, valid for three months, are required with all suckers used for sale or circulation. On any plot infested by either of these diseases the burning of affected stools on the spot in the presence of an agricultural official is compulsory, the same measure to be applied to all stools within a radius of not less than 10 m. from the centre of infection. Infested areas may not be replanted with bananas within two years.